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REPORT ON AN EVALUATION

OF

SEARCH AND RESCUE

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PROGRAM EVALUATION

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GLOSSARY OF ABBREVIATIONS

AATA	Administrator, Air Transportation Administration
AAWRS	Arctic Aviation Weather Reporting Station
AC	Air Command
ACC	Area Control Centre
AD	Airworthiness Directive
ADIS	Automated Data Interchange System
ADMC	Assistant Deputy Minister Co-ordination, DOT
ADTIC	Arctic Desert Tropic Information Centre, USA
AES	Atmospheric Environment Service, Environment Canada
AFRCC	US Air Force Rescue Co-ordination Centre
AIC	Aeronautical Information Circulars
AIP	Aeronautical Information Publications-Canada
AIRCOM	Air Command
AIS	Aeronautical Information Service
ANO	Air Navigation Order
APD	Approval in Principle Document
AR	Air Regulation
ATAC	Air Transport Association of Canada
ATC	Air Traffic Control
ATGH	Air Transport Group Headquarters
ATIS	Automatic Terminal Information Service
ATS	Air Traffic Services
AWIS	Aviation Weather Information Service
BC	British Columbia
BOSDET	Boating Safety Detachment
CADO	Chief of Air Doctrine and Operations
CALFAA	Canadian Air Line Flight Attendants Association
CAIC	Civil Aeronautics Implementation Co-ordination
CALPA	Canadian Airline Pilots Association
CARES	Civil Air Rescue Emergency Service, Albert Aviation Council
CASARA	Civil Air SAR Association
CASB	Canadian Aviation Safety Board
CATA	Canadian Air Transportation Administration
CB	Citizens Band
CCG	Canadian Coast Guard
CCGI	Chief, Casualty Investigation, CCG
CCOM	Cabinet Committee
CF	Canadian Forces
CGRO	Coast Guard Rescue Officer
CGVR	Chief, Search and Rescue, CCG
CMRA	Canadian Marine Rescue Auxiliary
CMTA	Canadian Marine Transportation Administration
COPA	Canadian Owners and Pilots Association
CPS	Canadian Power Squadrons
CRR	Communication Requirements Request
CSA	Canadian Standards Association
CTC	Canadian Transport Commission
CY	Current Year
CYA	Canadian Yachting Association

DAB	Airworthiness Branch, CATA
DAF	Flight Services Branch, CATA
DAOT	Directorate of Air Operations and Training, DND
DAS	Aviation Safety Bureau, CATA
DAT	Air Traffic Services Branch, CATA
DCDS	Deputy Chief of the Defence Staff
DCostS	Director of Costing Services, DND
DEA	Department of External Affairs
DFO	Department of Fisheries and Oceans
DGCA	Director General, Civil Aeronautics, CATA
DIANA	Department of Indian and Northern Affairs
DLI	Aeronautical Licensing and Inspection Branch, CATA
DLR	Legislative Review Branch, CATA
DM	Deputy Minister
DMC	Defence Management Committee
DND	Department of National Defence
DOC	Department of Communications
DOJ	Department of Justice
DOT	Department of Transport
DPD	Aeronautical Policy, Planning, Programing Branch, CATA
DPMS	Defence Program Management System
DPW	Department of Public Works
DSL	Aeronautical Standards and Legislation Branch, CATA
DSP	Defence Services Program
DSPIS	Defence Services Program Information Systems
DSR	Defence Structure Review
DSS	Department of Supply and Services
DTA	Telecommunications and Electronics Branch, CATA
ECAREG	East Coast Traffic Regulatory System
ELT	Emergency Locator Transmitter
EMR	Energy, Mines and Resources
EMT	Emergency Medical Treatment
EPIRB	Emergency Position Indicating Radio Beacon
FAA	Federal Aviation Administration, USA
FIR	Flight Information Region
FIS	Financial Information Systems
FSS	Flight Service Station
FVOA	Fishing Vessel Owners Association
G & C	Grants and Contributions
GRS(CB)	General Radio Service (Citizen's Band)
HF	High Frequency
HQ	Headquarters
HWC	Health and Welfare Canada
ICAO	International Civil Aviation Organization
ICSAR	Interdepartmental Committee on Search and Rescue
IFR	Instrument Flight Rules
IMCO	International Maritime Consultative Organization
I/O	Inboard/Outboard marine engine
IRB	Inshore Rescue Boat
LOGUIDE	Logistics Guidance Document
LKP	Last Known Position
LT	Locator Transmitter

LTP	Long-Term Project
MAC	Manitoba Aviation Council
MACAP	Manitoba Aviation Council Air Patrol
MACR	Material Authorization Change Request
MHZ	Megahertz
MIS	Management Information System
MND	Minister of National Defence
MOU	Memorandum of Understanding
MRI	Meteorological Requirements Index
MSAC	Marine Safety Advisory Council
MSED	Ministry of State for Economic Development
NAME-AO	Notice to Aircraft Maintenance Engineers and Aircraft Owners
NB	New Brunswick
NDHQ	National Defence Headquarters
NE	Northeast
NORDREG	Arctic Canada Traffic System
NOTAM	Notice to Airmen
NS	Nova Scotia
NWT	Northwest Territories
O&M	Operations and Maintenance
OGD	Other Government Department
OPI	Office of Primary Interest
OPMS	Operational Performance Measurement System
OR	Operations Research
ORAE	Operational Research & Analysis Establishment
PAD	Program Approval Document
PAWRS	Private Aviation Weather Reporting Stations
PCB	Program Control Board
PCBSC	Program Control Board Sub-Committee
PCO	Privy Council Office
PCP	Program Change Proposal
PDP	Program Development Proposal
PEI	Prince Edward Island
PEP	Provincial Emergency Program, BC Department of Environment
PFD	Personal Flotation Device
PLB	Personal Locator Beacon
PM	Prime Minister
PMS	Performance Measuring System
PO&M	Personnel, Operations and Maintenance
PPBS	Planning, Programming and Budgeting System
PPMS	Program, Planning and Management System
PPP	Program Planning Proposal
PRFCA	Prince Rupert Fishermen's CO-OP Association
PY	Person-Year
R&D	Research and Development
RASO	Regional Aviation Safety Officer, CATA
RCC	Rescue Co-ordination Centre
RCCA	Regional Controller, Civil Aviation, CATA
RCFCA	Royal Canadian Flying Club Association
RCMP	Royal Canadian Mounted Police
RSAI	Regional Superintendent, Accident Investigation, CATA
RMSAR	Regional Manager SAR
SAR	Search and Rescue

SARCORE	Search and Rescue Co-ordination Review
SARCUP	Search and Rescue Capability Up-Date Program
SAREC	Search and Rescue Emergency Centre
SARS	Ships Activity Reporting System
SARSAT	Search and Rescue Satellite Aided Tracking
SARSTATS	SAR Statistics generated by DND
SE	Southeast
SEMAD	Saskatchewan Emergency Measures Air Division
SITREPS	Situation Report generated by RCC
SOLAS	International Convention for Safety of Life At Sea
SOR (P)	Statement of Requirement (Preliminary)
SRR	Search and Rescue Region
T&E	Telecommunications and Electronics
TBS	Treasury Board Secretariat
TC	Transport Canada
TCA	Terminal Control Area
TC/AIDS	Accident-Incident DATA System-Aviation Statistics Generated by Transport Canada
TCTI	Transport Canada Training Institute
TCU	Terminal Control Unit
TRSA	Terminal Radar Service Area
UFAWU	United Fishermen and Allied Workers Union
UK	United Kingdom
UNSAR	Unnecessary SAR Alert
US, USA	United States of America
USAF	United States Air Force
USCG	United States Coast Guard
VCDS	Vice-Chief of the Defence Staff
VFR	Visual Flight Rules
VHF/DF	Very High Frequency/Direction Finding
VTM	Vessel Traffic Management

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PART 1 - INTRODUCTION

SECTION I - THE SEARCH AND RESCUE EVALUATION

Background

1.1 This Report on an Evaluation of Search and Rescue responds to a request from Ministers that the Chairman of the Deputy Ministers Committee on Foreign and Defence Policy, in consultation with the Secretary of the Treasury Board and the Comptroller General, arrange for an assessment of the effectiveness of Search and Rescue in the form of a program evaluation.

Purpose

1.2 The purpose of the evaluation is to assess the effectiveness of the Search and Rescue program and to recommend improvement.

Conduct

1.3 Terms of Reference for the evaluation were set out in a letter to the Deputy Ministers concerned from the Secretary General of the Interdepartmental Secretariat to the Committee on Foreign and Defence Policy.

1.4 The evaluation was carried out under the general direction of a team leader seconded to the Privy Council office from the Treasury Board Temporary Assignment Pool, with the assistance of an officer from the Department of National Defence, four officers from the Department of Transport, and an officer from the Ministry of State for Science and Technology. Administrative support was provided by the Department of External Affairs. The team leader reported through the Secretary General of the Secretariat to the Chairman of the Committee.

1.5 Salaries and travel expenses of the team were paid by their respective departments. Data processing costs were shared by DND, DOT, DFO and DEA. As well, DND provided specialist advice on operations research and support in statistical analysis.

Description

1.6 The evaluation was designed to:

(a) describe the SAR program including its clientele, the nature of the incidents in which they are involved, the manner in which program activities are delivered and their cost, program outputs and their characteristics, the level of SAR operational performance, and the management of the program;

(b) assess the extent to which SAR has achieved its objectives and relate this to the manner of program delivery;

(c) conduct a review of the management processes and organization.

1.7 The work of the evaluation was divided into three main areas:

(a) an operations evaluation examining SAR incidents, resourcing and the relation of SAR operations to incidents;

(b) a SAR prevention evaluation examining the scope of prevention programs undertaken by various departments and other organizations;

(c) a management evaluation including the management process and organization of the SAR program, both at present, and the possibilities for the future.

Methods

1.8 The methods of approach included:

(a) reviews of previous analyses of search and rescue in Canada and elsewhere, documentation on SAR incidents, planning, program structure and processes, both public and internal to departments;

(b) expert opinion and interviews of departmental headquarters and field staff, volunteers, members of the public and experts of other nations;

(c) case studies, primarily for the SAR prevention activity including an examination of a sample of incidents.

(d) analysis and recommendations, including rigorous statistical analysis where data was available, qualitative interpretation of documentation, journalistic evaluation and summary analysis leading to recommendations for the future SAR program.

Acknowledgement

1.9 The team acknowledges with thanks the courtesy and help received from members of the public, including representatives of unions, volunteers and their organizations, and from provincial government organizations with an interest in emergency measures and search and rescue. In addition, and equally valuable, was the assistance and advice of many officers and specialists in various federal government departments both at headquarters and in the field, who have responsibilities for search and rescue and for aviation and marine safety in general. Their patience and the generosity with which all those interviewed gave time from pressing operational and other responsibilities to discuss search and rescue issues is much appreciated.

1.10 The team would particularly like to thank officers and men of the United States Coast Guard and the United States Air Force, and officials of the United States Federal Air Administration who shared their perspectives and experience on search and rescue with the team.

SECTION 2 - STRUCTURE OF THE EVALUATION REPORT

2.1 The SAR Evaluation Report includes all material addressing the evaluation questions including descriptive material, extent of objectives achievement, possible program changes, organization and program management issues, observations, conclusions and pertinent annexes. It is organized in seven parts as follows:

PART I Introduction

Section 1 The SAR Evaluation
Section 2 Structure of the Evaluation Report

PART II The SAR Program Profile

Section 1 The SAR Program
Section 2 The SAR Milieu
Section 3 The SAR Scene and Clientele
Section 4 The Program in Operation
Section 5 Program Results
Section 6 Conclusions

PART III SAR Operations

Section 1 Description
Section 2 Operations Activities
Section 3 Level of Service Standards and Goals
Section 4 SAR Resource Allocation
Section 5 Conclusions

PART IV SAR Prevention

Section 1 Introduction
Section 2 Overview of SAR Prevention
Section 3 Aviation SAR Prevention - Target Population
Section 4 Analysis of Aviation SAR Prevention Sub-Activities
Section 5 Marine SAR Prevention - Target Population
Section 6 Analysis of Marine SAR Prevention Sub-Activities
Section 7 Response to Evaluation Assessment Issues

PART V Associated Activities Impinging on SAR

Section 1 Introduction
Section 2 Associated Activities - Air
Section 3 Associated Activities - Marine

PART VI The Management Process

Section 1 SAR Planning and Control
Section 2 The National SAR Plan
Section 3 The SAR Planning Process
Section 4 Analysis of SAR Planning and Control
Section 5 Discussion and Summary Conclusions

PART VII Synthesis of Observations, Conclusions, Resulting Issues and Recommendations

Additional Documentation

2.2 The Interdepartmental Secretariat to the Committee of Deputy Ministers on Foreign and Defence Policy has on file the team's record of interviews. The library of material accumulated by the team on search and rescue matters has been turned over to the Secretariat of the Interdepartmental Committee on Search and Rescue.

PART II - THE SAR PROGRAM PROFILE

SECTION 1 - THE SAR PROGRAM

General

1.1 Various nations approach resolving the SAR operations task by assigning responsibilities in varying ways to different levels of government or organizations. There is also a tradition of self-help in some countries where the response is accomplished by volunteers meeting a local need, especially in the marine world. In Canada, the SAR Program is a collection of activities performed by several departments, developed historically from individual air and marine requirements. A true form of integration of the efforts of federal departments began in 1976 with the formation of the Interdepartmental Committee on Search and Rescue (ICSAR) and the associated development of the annual National SAR Plan.

1.2 In many other countries (e.g. U.S.A., U.K., Australia) the National SAR Plan is limited to a definition of the SAR responsibilities of various national, provincial and local authorities and such responsibilities are clearly set out in a National SAR Manual. Thus while Canada has gone further than other countries in co-ordinating federal government efforts and resourcing through its National SAR Plan, the plan does not describe the role of other authorities, nor indicate the resources available to them for SAR.

Federal Government's Role

1.3 Historically, in Canada, the federal SAR role grew out of both a need and the air response to its international ICAO obligations, as recommended by Annex 12 to the Chicago Convention, to provide SAR services for specific geographical areas. This responsibility was assigned to the RCAF and continues to be a function of the Department of National Defence. Marine SAR has a longer history, rising largely out of local needs for water rescue services, then growing to meet the needs of commerce and international agreements through IMCO and SOLAS and services being provided by the Marine Administration of the Department of Transport. In conjunction with this evolution of the federal SAR service, the system was put in place to assist the safety of air and marine navigation.

1.4 The federal SAR program is intended primarily to provide search and rescue services to persons involved in air and marine distress incidents. Additionally, the program provides assistance to prevent or relieve human suffering in emergency situations not directly related to air and marine distress incidents, such as mercy medical evacuation. It also assists civil authorities in local incidents including searches for missing persons.

1.5 The program assists the air and marine population in two ways. First, it provides them with SAR services whenever they are involved in an air or marine incident, when the authorities are aware of the occurrence.

Secondly, to counter the fact that most SAR incidents are generated by the inexperienced or by imprudent air and boating practices, the SAR program, through government and other groups, fosters incident prevention through education, regulation and enforcement.

Federal SAR Organization

Roles and Responsibilities of Federal Departments Involved in Search and Rescue (See Figure 1-1A)

1.6 Department of National Defence is responsible for co-ordinating all air and marine search activities in Canada and adjacent areas for which Canada has accepted responsibility under international agreements. The Minister of National Defence is the lead minister and the government spokesman on Search and Rescue. The Department is also responsible for providing dedicated air resources to respond to both air and marine distress incidents.

1.7 Department of Transport is responsible for providing dedicated marine resources for marine incidents and for assisting the Department of National Defence in co-ordinating response to marine incidents. It is also responsible for the air and marine accident prevention aspects of Search and Rescue. In addition, the Department of Transport principally through its Air Traffic Control Units, Flight Service Stations, Coast Guard Marine Radio Stations and Vessel Traffic Management Centres, can detect aircraft and vessels in need of SAR assistance/aid and hence, alert the Rescue Co-ordination Centres and the Search and Rescue Emergency Centres.

1.8 Department of Fisheries and Oceans may be secondarily tasked to provide marine resources for marine incidents. In fact, it has designated 17 vessels in 1981/82, as multi-tasked for the SAR role. The remaining 250 (approximately) respond to SAR, as do all other vessels, under section 445 of the Canada Shipping Act and the provisions of Cabinet Directive 22 (1951) which applies to all federal government departments.

1.9 Royal Canadian Mounted Police air and marine units may, as indicated in the SAR plan, be secondarily tasked and land units play a role in the verification of SAR incidents as part of their normal policing duties. In jurisdictions where RCMP provides police services, they are also responsible for enforcement when breaches of air and marine regulations are identified by DOT inspectors and Coast Guard Officers.

1.10 Department of Public Works operates ships and tugs associated with port construction. These may be called upon as ships of opportunity to support SAR operations.

Other Organizations

Air Organizations

1.11 Other groups support the SAR program to provide assistance to the federal SAR response. Provincial government sponsored groups and/or volunteer groups operate in co-operation with the RCC and local SAR

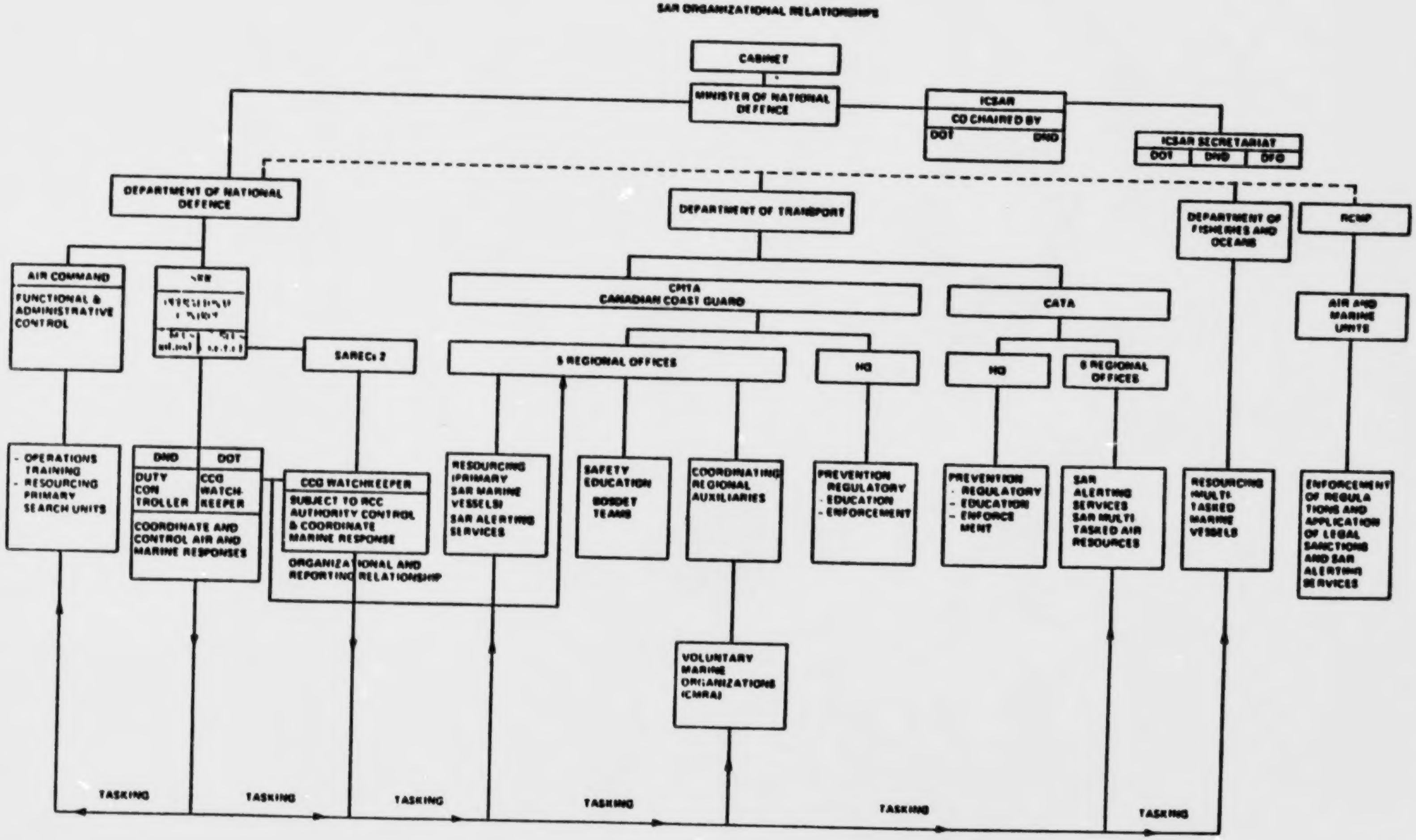
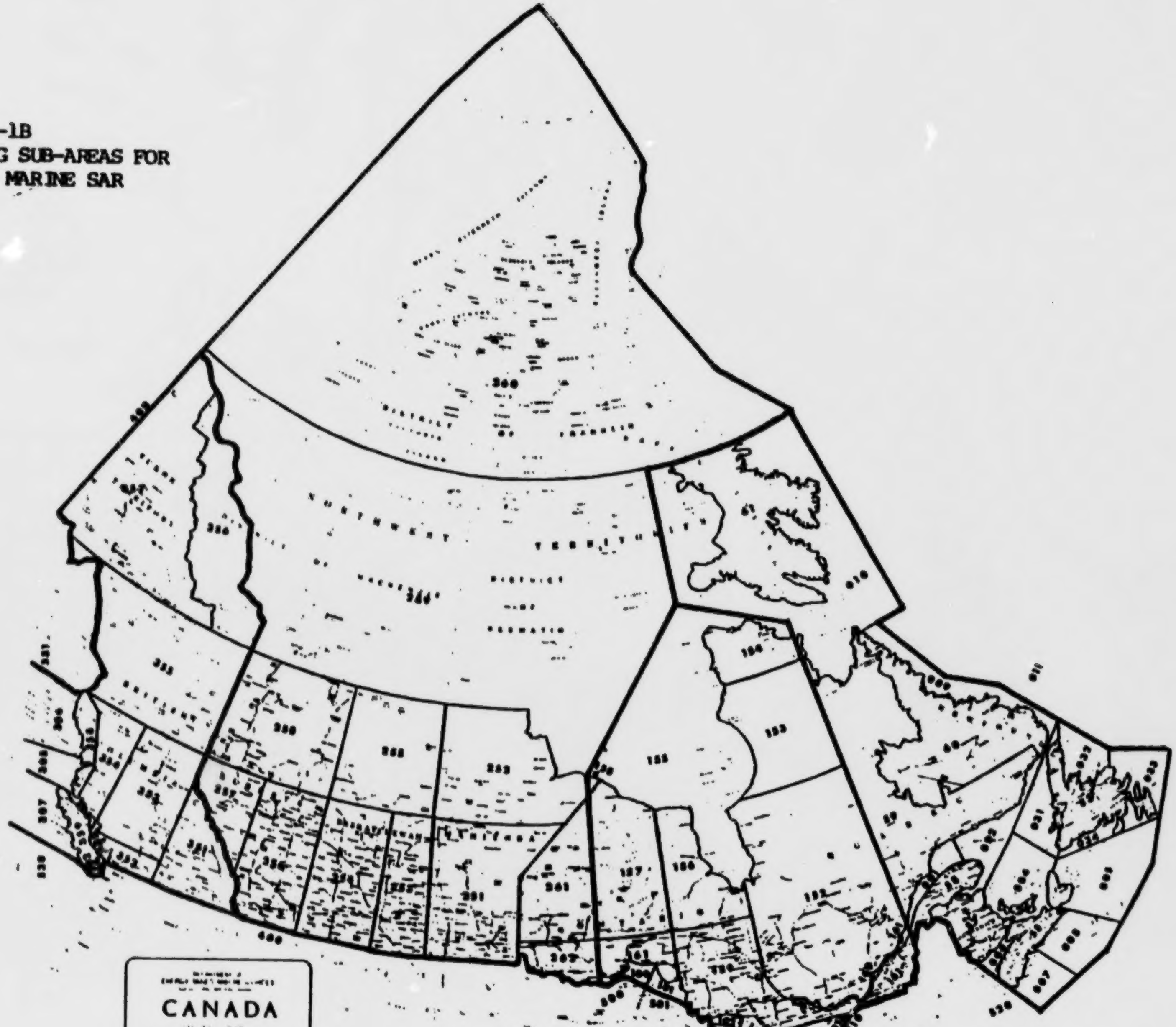
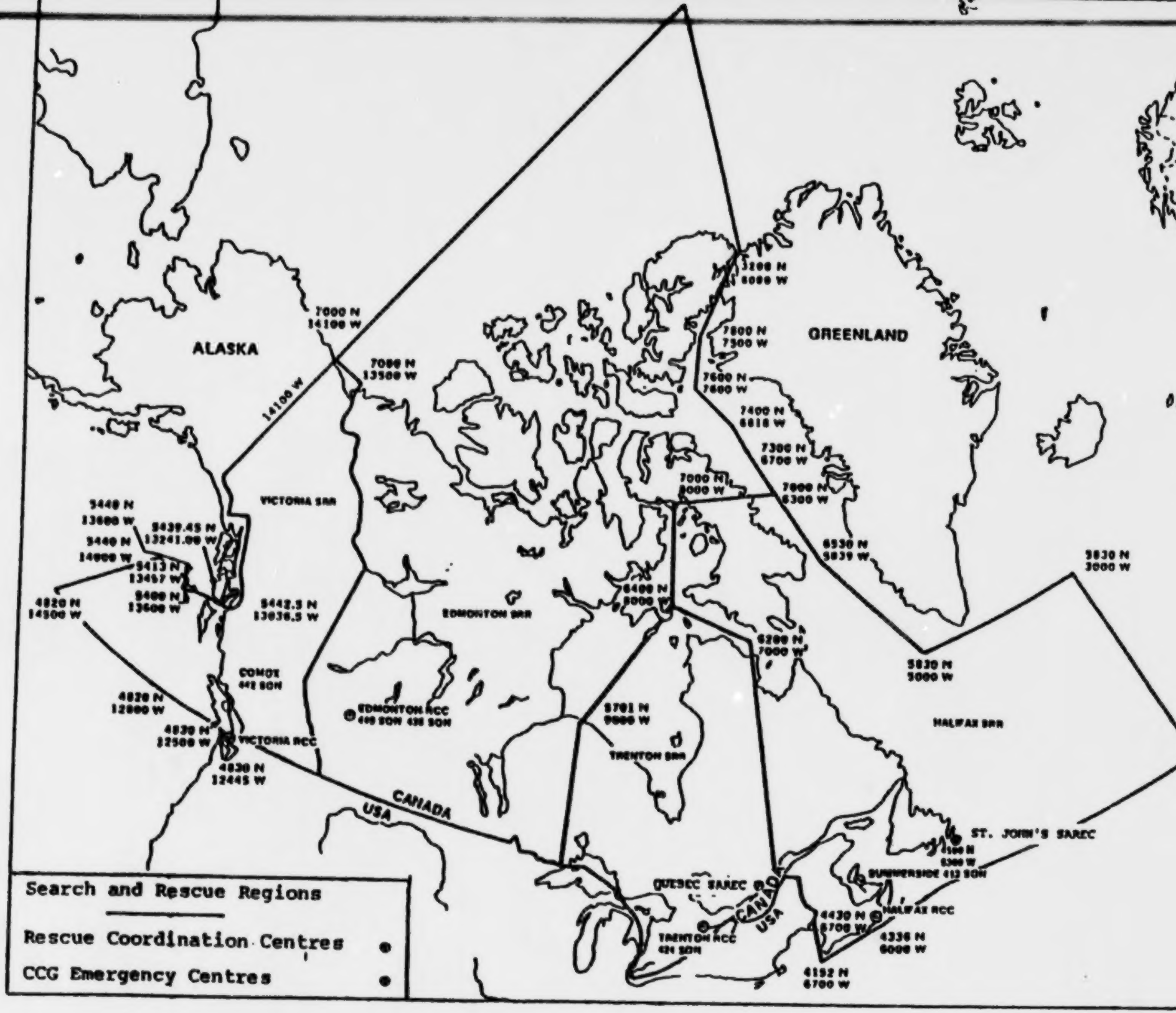

SAR ORGANIZATIONAL RELATIONSHIPS
CABINET
MINISTER OF NATIONAL DEFENCE
ICSAR
CO CHAIRED BY
DOT
DND
ICSAR SECRETARIAT
DOT
DND
DFO
DEPARTMENT OF NATIONAL DEFENCE
DEPARTMENT OF TRANSPORT
DEPARTMENT OF FISHERIES AND OCEANS
RCMP
AIR COMMAND
FUNCTIONAL & ADMINISTRATIVE CONTROL
SARECs 2
CMTA
CANADIAN COAST GUARD
CATA
5 REGIONAL OFFICES
HQ
HQ
5 REGIONAL OFFICES
AIR AND MARINE UNITS
- OPERATIONS TRAINING
- RESOURCING PRIMARY SEARCH UNITS
DND
DOT
DUTY CON TROLLER
CCG WATCH KEEPER
COORDINATE AND CONTROL AIR AND MARINE RESPONSES
CCG WATCHKEEPER
SUBJECT TO RCC AUTHORITY CONTROL & COORDINATE MARINE RESPONSE
ORGANIZATIONAL AND REPORTING RELATIONSHIP
RESOURCING (PRIMARY SAR MARINE VESSELS)
SAR ALERTING SERVICES
SAFETY EDUCATION
BOSDET TEAMS
COORDINATING REGIONAL AUXILIARIES
PREVENTION REGULATORY
- EDUCATION
- ENFORCEMENT
PREVENTION
- REGULATORY
- EDUCATION
- ENFORCE MENT
SAR ALERTING SERVICES SAR MULTI TASKED AIR RESOURCES
RESOURCING MULTI-TASKED MARINE VESSELS
ENFORCEMENT OF REGULATIONS AND APPLICATION OF LEGAL SANCTIONS AND SAR ALERTING SERVICES
VOLUNTARY MARINE ORGANIZATIONS (CMRA)
TASKING
TASKING
TASKING
TASKING
TASKING
TASKING

Figure 1-1A

TABLE 1-1B
EXISTING SUB-AREAS FOR
AIR AND MARINE SAR


NORTHWEST TERRITORIES
CANADA


ALASKA
GREENLAND
VICTORIA SRR
EDMONTON SRR
TRENTON SRR
HALIFAX SRR
CANADA
USA
141 00 W
7000 N 14100 W
7000 N 13500 W
8200 N 6000 W
7800 N 7300 W
7600 N 7600 W
7400 N 6818 W
7300 N 6700 W
7000 N 6300 W
6530 N 5839 W
5830 N 3000 W
5830 N 5000 W
4500 N 3000 W
7000 N 8000 W
6400 N 8000 W
6200 N 7000 W
5701 N 9000 W
5448 N 13600 W
5439.45 N 13241.00 W
5440 N 14000 W
5413 N 13457 W
5400 N 13600 W
5442.5 N 13038.5 W
4820 N 14500 W
4820 N 12800 W
4830 N 12500 W
4830 N 12445 W
COMOX 442 SQN
VICTORIA RCC
EDMONTON RCC 440 SQN 435 SQN
TRENTON RCC 424 SQN
QUEBEC SAREC
ST. JOHN'S SAREC
4500 N 5300 W
SUMMERSIDE 413 SQN
HALIFAX RCC
4430 N 6700 W
4336 N 6000 W
4152 N 6700 W
Search and Rescue Regions
Rescue Coordination Centres
CCG Emergency Centres

Existing Canadian SAR Delimitation and SRR Boundaries

Figure 1-1C

squadrons. The western provinces provide the most cohesive groups. SAR squadrons and RCC personnel provide defensive flying, search training and spotter courses. Provincial organizations provide the organization, structure and in some cases, supplementary resources of non-capital equipment. Both provincially sponsored and volunteer organizations provide limited trained pilots and spotters as well as the use of private aircraft. Existing organizations are :

(a) Provincial Emergency Program (PEP) - organized and sponsored by the BC Department of the Environment, Emergency Programs Division.

(b) Civil Air Rescue Emergency Services (CARES) - sponsored by the Alberta Department of Transportation through an annual grant to the Alberta Aviation Council.

(c) Saskatchewan Emergency Measures Air Division (SEMAD), sponsored by the Saskatchewan Emergency Measures Group.

(d) Manitoba Aviation Council, Air Patrol - a division of the MAC which operates under a grant from the Manitoba Government.

(e) Local organizations centred in a few cities such as Fort McMurray, Thunday Bay, Sault St. Marie, Chilliwack and others.

1.12 The federal government is sponsoring a study to provide some national structure and encouragement to these kinds of organizations. ICSAR is examining the problem of forming a Civil Air SAR Association (CASARA) to provide provincial and local air units to augment DND SAR resources. An additional benefit will be the fostering of air safety practices and education.

Marine Organizations

1.13 Provincial and Municipal Government. Response to inland water SAR incidents and educational programs is mainly the task of the municipal and provincial police. Police forces own variously equipped response boats and hold standby status based on need and varying from a few minutes to an 'as required' basis. The Toronto Harbour Police represent an efficiency extreme with crew and boats on immediate launch capability overseeing boaters who must pass a knowledge and handling test to operate in the Toronto Harbour area.

1.14 In BC the Provincial Emergency Program (PEP) also supports Rescue 15, a volunteer organization in the Prince Rupert Area. Other similar organizations are located in Ontario. In B.C. a British Columbia Lifeboat Society and a Coast Watchers organization have been formed recently.

1.15 Canadian Marine Rescue Auxiliary (CMRA). The CMRA was established in 1979 to assist the Canadian Coast Guard by providing needed primary and augmented rescue services as well as to promote safe boating practices.

1.16 The Auxiliary has five Regional Associations (Western, Central, Laurentian, Maritimes, Newfoundland) with boundaries roughly matching those of the CCG. These associations which have grown to a membership of 1027 are federally incorporated. Each association is linked to the Coast Guard by a formal contract which defines the respective responsibilities of each party and provides for a degree of government control.

1.17 The training of the CMRA members is co-ordinated by the Coast Guard. To date, the Auxiliary has been involved mainly in SAR operations. Full use has not been made of the CMRA for prevention activities.

Capital Resources (1981/82)

Vessels and Aircraft

1.18 The Department of Transport (Marine Administration) has 37 vessels and 3 hovercraft designated as primary SAR on a year-round basis and 28 inshore rescue boats utilized in summer only, for a total of 68 dedicated SAR vehicles. All other ships of the Canadian Coast Guard are utilized under Section 445 of the Canada Shipping Act. The Department of Transport operates 36 assorted rotary wing aircraft (helicopters) which have been identified by ICSAR as secondary aircraft.

1.19 The Department of National Defence has 23 aircraft designated as primary SAR, 11 fixed wing and 12 rotary wing. If these primary aircraft are not adequate to meet all requirements of any particular SAR mission, secondary aircraft from any Canadian Forces unit can be committed to the operation.

1.20 The Department of Fisheries and Oceans has designated 17 vessels as multi-tasked for the SAR role for the year 1981/82. The remaining 250 vessels (approximately) respond to SAR, as do all other vessels, under Section 445 of the Canada Shipping Act.

Communications Facilities

1.21 The Department of Transport maintains a network of air and marine communications systems and links with other government and private systems which can be used to detect and report incidents.

1.22 In the Rescue Co-ordination Centres (RCCs), direct telephone line services exist with DOT Air Traffic Control Centres and SAR squadrons (air and marine). In addition, RCCs are connected to the DOT Automated Data Interchange System (ADIS) network (teletype only). RCCs also have an Air/Ground/Air communication capability with SAR aircraft including short range and long range types.

1.23 In the Department of National Defence, four high frequency long range stations (Military Aeronautical Communication Systems) exist for long range communications. These facilities can provide communications with search masters and aircraft conducting searches.

1.24 In addition, radios are used to maintain contact between the Rescue Co-ordination Centres and SAR aircraft and vessels.

Objectives

1.25 There are no ministerially approved objectives for the National Search and Rescue (SAR) Program. Accordingly, the Evaluation Team has determined the implicit objectives that SAR managers are pursuing from a review of documents and interviews. (In Part VI of the report, the implications of such a set of objectives are discussed and commented on.) The National Search and Rescue Program objectives for areas under Canada's jurisdiction may be summarized as follows:

(a) To have in place, a SAR operations capability to:

- i) know of the occurrence of all air and marine SAR incidents.
- ii) locate all missing air and marine vehicles and personnel involved in distress incidents;
- iii) save the lives of all survivors of air and marine distress incidents;
- iv) minimize loss of property pending availability of salvage services, especially for marine distress incidents;
- v) provide humanitarian assistance and civil aid;
- iv) fulfill international SAR obligations.

(b) To have in effect SAR prevention measures to:

- i) deter the generation of SAR incidents by marine and air vehicle owners and operators;

(c) To have in place an organization to plan, co-ordinate, control, and provide information for the SAR Program.

(d) To make optimum use of associated services in support of SAR operational and prevention activities.

1.26 Departmental objectives within this program description will be reviewed under the subsequent sections of Operations, Prevention and the Management Process.

The Program

1.27 To achieve the above objectives, the SAR Program is executed by a series of major activities. These are grouped into four categories :

(a) Operations
(b) Prevention
(c) Management Process
(d) Other Programs that impinge on SAR

SEARCH AND RESCUE LOGIC MODEL

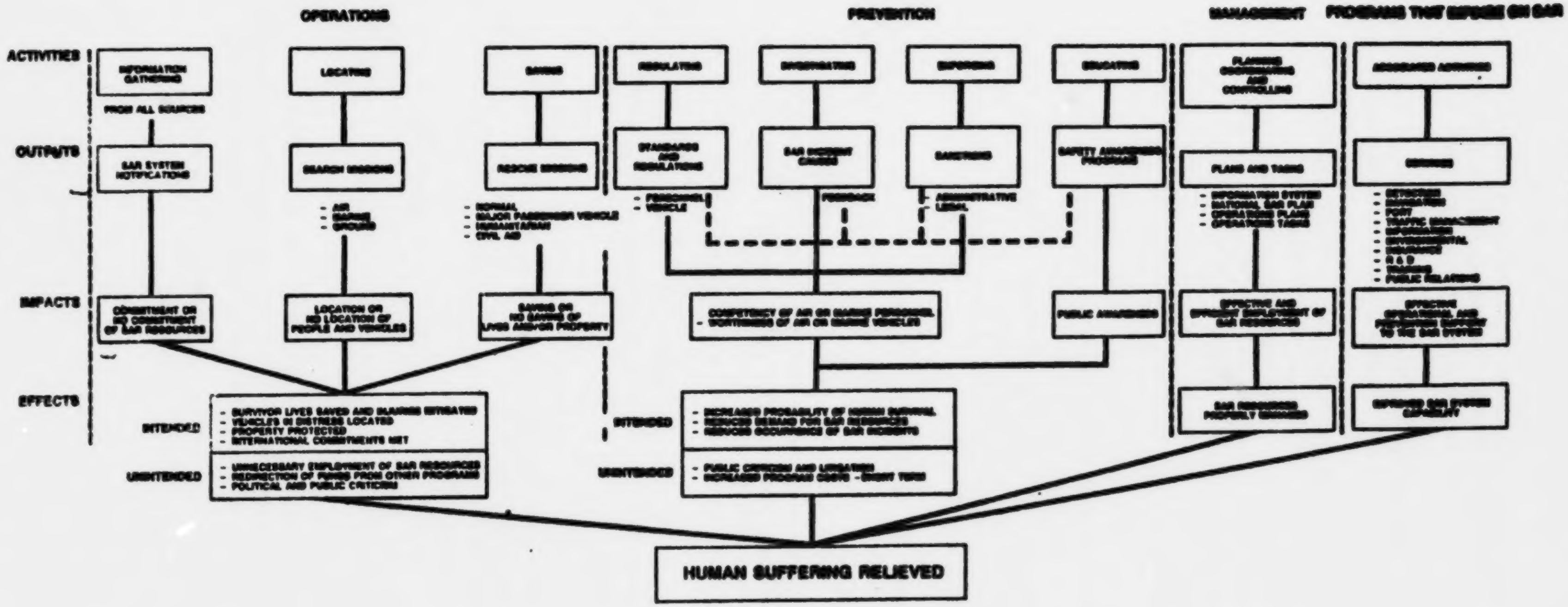

OPERATIONS
PREVENTION
MANAGEMENT
PROGRAMS THAT IMPINGE ON SAR
ACTIVITIES
OUTPUTS
IMPACTS
EFFECTS
INFORMATION GATHERING
FROM ALL SOURCES
SAR SYSTEM NOTIFICATIONS
COMMITMENT OR NO COMMITMENT OF SAR RESOURCES
LOCATING
SEARCH MISSIONS
- AIR
- MARINE
- GROUND
LOCATION OR NO LOCATION OF PEOPLE AND VEHICLES
SAVING
RESCUE MISSIONS
- NORMAL
- MAJOR PASSENGER VEHICLE
- HUMANITARIAN
- CIVIL AID
SAVING OR NO SAVING OF LIVES AND/OR PROPERTY
INTENDED
- SURVIVOR LIVES SAVED AND INJURIES MITIGATED
- VEHICLES IN DISTRESS LOCATED
- PROPERTY PROTECTED
- INTERNATIONAL COMMITMENTS MET
UNINTENDED
- UNNECESSARY EMPLOYMENT OF SAR RESOURCES
- REDIRECTION OF FUNDS FROM OTHER PROGRAMS
- POLITICAL AND PUBLIC CRITICISM
REGULATING
STANDARDS AND REGULATIONS
- PERSONNEL
- VEHICLE
INVESTIGATING
SAR INCIDENT CAUSES
FEEDBACK
ENFORCING
SANCTIONS
- ADMINISTRATIVE
- LEGAL
EDUCATING
SAFETY AWARENESS PROGRAMS
- COMPETENCY OF AIR OR MARINE PERSONNEL
- WORTHINESS OF AIR OR MARINE VEHICLES
PUBLIC AWARENESS
INTENDED
- INCREASED PROBABILITY OF HUMAN SURVIVAL
- REDUCED DEMAND FOR SAR RESOURCES
- REDUCED OCCURRENCE OF SAR INCIDENTS
UNINTENDED
- PUBLIC CRITICISM AND LITIGATION
- INCREASED PROGRAM COSTS - SHORT TERM
PLANNING COORDINATING AND CONTROLLING
PLANS AND TASKS
- INFORMATION SYSTEM
- NATIONAL SAR PLAN
- OPERATIONS PLANS
- OPERATIONS TASKS
EFFECTIVE AND EFFICIENT EMPLOYMENT OF SAR RESOURCES
SAR RESOURCES PROPERLY MANAGED
ASSOCIATED ACTIVITIES
SERVICES
- DETECTION
- NAVIGATION
- PORT
- TRAFFIC MANAGEMENT
- ENVIRONMENTAL
- INSURANCE
- R & D
- TRAINING
- PUBLIC RELATIONS
EFFECTIVE OPERATIONAL AND PREVENTION SUPPORT TO THE SAR SYSTEM
IMPROVED SAR SYSTEM CAPABILITY
HUMAN SUFFERING RELIEVED

Figure 3-2

1.28 These categories, their composite major activities and the outputs and effects are schematically illustrated in the SAR logic model at Figure 3-2. The specific departments which perform the activities are:

(a) Information gathering from all sources on possible SAR incidents and notifying Rescue Co-ordination Centres;

- Department of Transport (CATA) alerting posts, communications networks and systems;
- Department of Transport (CMTA/CCG) communication networks and systems;
- Department of National Defence (DND) communications systems;
- RCMP and other police forces;
- Others.

(b) Locating aircraft, vessels and people in distress (state and private aircraft, vessels and ground parties).

(c) Saving survivors of air/marine distress incidents and minimizing damage to property, as well as responding to humanitarian and civil aid requests (state and private aircraft, vessels and ground parties).

(d) Regulating, including the development and promulgation of air and marine safety and personnel survival standards, regulations, orders and directives.

- Department of Transport, CATA and CMTA/CCG;
- Department of National Defence for military operations;
- Department of Communications;
- Department of Health and Welfare.

(e) Investigating events that led to air and marine SAR incidents, establishing causes and notifying other agencies of investigation findings:

- Department of Transport, (CATA), Aviation Safety Bureau;
- Department of Transport, (CMTA/CCG), Casualty Investigation Branch;
- Department of Transport, Regional Accident/Casualty investigation units;
- Department of National Defence.

(f) Enforcing compliance with air and marine safety standards and regulations:

- Department of Transport CATA and CMTA/CCG;
- Solicitor General, RCMP;
- Department of Justice.

(g) Educating aviation and marine communities on accident/incident prevention and promoting air and boating safety;

- Department of Transport (CATA), Aviation Safety Bureau;
- Department of Transport (CMTA/CCG), Ship Safety Branch;
- Department of National Defence SAR briefing teams.

(h) Planning, co-ordinating and controlling SAR strategies, policies, goals, resource requirements, resource allocations and operations.

- Interdepartmental Committee on Search and Rescue (ICSAR) member departments (DND, DOT, DFO, DOE (AES), RCMP, DIANA, and EMR);
- DND and DOT/CCG for co-ordination and control of SAR operations.

(i) Utilizing service outputs of associated Program activities including those of federal, provincial, municipal and foreign governments and private organizations.

1.29 The logic model further shows impacts and results of the SAR program. These will be discussed in the sections which follow.

Observations

1.30

(a) No overall objectives for the "SAR Program" have been explicitly defined. The interdepartmental Evaluation Team has derived a set of objectives to which the departments concerned are responding.

These implicit objectives do not have specific Treasury Board or Cabinet approval.

(b) Some of these objectives could be treated as policies for the use of SAR resources rather than objectives to be met in resource planning.

Such a point of view would have substantial implications for resourcing.

(c) There are many provincial and private organizations with an interest in and capabilities for search and rescue. This role is not specifically recognized in the National SAR Plan, nor does the option of encouraging their expansion seem to have been seriously considered.

(d) The volunteer spirit is still strong in Canada, particularly in the Western provinces and there is provincial support for organizations which play a role in SAR.

SECTION 2 - THE SAR MILIEU

Introduction

2.1 In Canada, the SAR Program operates in a relatively sparsely populated country with rugged terrain and coastline, and difficult weather conditions. Aviation and marine activities are both a necessary economic function and a widely pursued recreational activity. Mainly in the course of the latter, aircraft and boats get into difficulties. As a result, the lives of the crew and passengers of the aircraft or boat may be in peril and rescue by an assisting service is necessary. Should the air incident occur in a remote area or the marine incident occur away from a safe harbour, a SAR incident is generated and a SAR response is required.

2.2 In Canada, because of severe weather, cold air and water temperatures and the remoteness and wildness of much of the country, survival of those who experience a SAR incident requires a ready response force. It also requires that the air and marine craft operators carry equipment to enhance survival and be knowledgeable in its use. The water temperature for much of the year and the simple fact that because of the size of the country, rescue resources will take time to get to the scene, dictate that airmen and boaters be prepared to survive on their own.

2.3 Despite these considerations, SAR incidents occur without the crew or the craft being prepared. Weather, topography or unexpected mechanical failure may also produce unfortunate victims who must be located and rescued. However, most SAR incidents result from imprudent acts by aircraft and boat operators, operating under-equipped craft in circumstances for which they have neither the training nor experience to handle. Once in trouble and often in peril of life, the operator is insufficiently equipped to help himself to survive until assistance comes.

2.4 In this milieu, the various levels of governments and some private or volunteer organizations provide a SAR service to save lives and, where pertinent, save property. Before examining the government program, specifically the federal government's SAR Program, it is important to understand the air and marine operating problems and the clientele of the SAR system. After an analysis of these areas, the report will describe the SAR Program and attempt to measure its results.

The Air Public

2.5 This public consists of the pilots and operators of domestic commercial and private aircraft, military, state and foreign aircraft using Canadian airspace or those international regions where Canada is responsible for SAR services. The following tables depict this air public.

TABLE 2-1 SUMMARY OF REGISTERED CIVIL AIRCRAFT

(JULY 31,81)

CATA REGION	FIXED WING			ROTARY WING			BALLOON	GLIDER	GYROPLANE
	COMMERCIAL	PRIVATE	STATE	COMMERCIAL	PRIVATE	STATE			
PACIFIC	847	2897	12	305	89	-	8	54	14
WESTERN	910	3628	10	287	48	6	43	79	10
CENTRAL	1033	3215	36	79	10	-	4	52	10
ONTARIO	1148	4315	135	184	27	48	33	228	26
QUEBEC	964	1832	26	261	25	8	11	88	43
ATLANTIC	262	520	13	55	15	6	1	13	4
TOTAL	5164	16398	232	1171	214	68	100	514	107
% OF TOTAL	21.5	68.4	1.0	4.9	0.9	0.3	0.4	2.1	0.5

AIRCRAFT TOTALS

TOTAL REGISTERED DOMESTIC CIVIL: 23,968

TOTAL DOMESTIC MILITARY: 500^{+}

AIRCRAFT MOVEMENTS

TABLE 2-2A - AIR TRAFFIC CONTROL IFR ACTIVITY RATES - 1980

BY FLIGHT PLANS

CATA FIR/ CENTRE	IFR FLIGHT PLANS HANDLED BY ACC'S/TCU'S				TOTAL	% OF GRAND TOTAL
	CIVIL		MILITARY			
	DOMESTIC	INTERNATIONAL	DOMESTIC	INTERNATIONAL		
VANCOUVER	198,995	7,192	8,089	371	214,647	11.9
EDMONTON	280,909	11,169	10,269	757	303,104	16.8
WINNIPEG	181,955	8,600	26,360	329	217,244	12.0
TORONTO	370,288	22,218	19,710	862	413,078	22.8
MONTREAL	226,783	29,418	14,385	2,680	273,266	15.1
MONCTON	122,088	93,411	20,305	12,930	248,734	13.8
GANDER	23,956	99,673	1,548	13,350	138,527	7.6
TOTALS	1,404,974	271,681	100,666	31,279	1,808,600	
% OF GRAND TOTAL	77.7	15.0	5.6	1.7		

(SOURCE: DOT/CATA/DAPF/A)

AIRCRAFT MOVEMENTS IFR

TABLE 2-2B - INTERNATIONAL IFR

FLIGHTS OF FOREIGN REGISTERED AIRCRAFT - 1980

Polar Routes	9,426	
Other (Oceanic, inland)	116,000	approx
TOTAL	125,000	approx

AIRCRAFT MOVEMENTS - VFR

TABLE 2-2C - AIR TRAFFIC CONTROL VFR ACTIVITY RATES 1980

CATA CENTRE	VFR FLIGHT PLANS HANDLED BY ACC'S		TOTAL	% OF TOTAL
	CIVIL	MILITARY		
VANCOUVER	35,009	269	35,278	23.7
EDMONTON	28,742	2,679	31,421	21.1
WINNIPEG	23,773	2,597	26,370	17.7
TORONTO	31,998	1,906	33,904	22.8
MONTREAL	8,849	124	8,973	6.0
MONCTON	10,073	1,859	11,932	8.0
GANDER	609	158	767	0.5
TOTALS	139,053	9,592	148,645	
% OF TOTAL	93.5	6.5		

AIRCRAFT MOVEMENTS - VFR

TABLE 2-2D - FSS VFR ACTIVITY RATES 1980 BY FLIGHT PLANS

CATA REGION	VFR FLIGHT PLANS/NOTIFICATIONS HANDLED BY FSS	
	TOTAL	% OF TOTAL
PACIFIC	52,997	14.6
WESTERN	124,547	34.4
CENTRAL	77,272	21.3
ONTARIO	51,782	14.3
QUEBEC	33,052	9.1
ATLANTIC	22,572	6.2
TOTAL	362,222	

(SOURCE: DOT/CATA/DAPF/A)

TABLE 2-3 - LICENSED PILOTS (JULY 1, 1981)

CATA REGION	STUDENT PERMITS	FIXED-WING			ROTARY-WING	
		PRIVATE	COMMERCIAL	AIRLINE TRANSPORT	COMMERCIAL	PRIVATE
PACIFIC	3789	6615	2120	1254	507	31
WESTERN	4201	7339	1580	854	364	18
CENTRAL	3264	6983	1482	616	144	11
ONTARIO	7920	13,034	2486	1696	355	35
QUEBEC	4674	5281	1587	1206	323	17
ATLANTIC	1282	1847	638	251	166	7
OTHER	105	99	89	77	47	-
TOTAL	25,235	41,198	9982	5954	1906	119
TOTAL POWERED AIRCRAFT PILOTS :84,394						

(SOURCE: DOT/CATA/DAPF/A)

ADDITIONALLY THERE ARE :	4015 PILOTS OF GLIDERS/BALLOONS ETC.
	317 NAVIGATORS AND FLIGHT ENGINEERS
	4000^{+} MILITARY PILOTS/NAVIGATORS/FLIGHT ENGINEERS

Expectations and Perceptions

2.6 Air operations are conducted within a relatively well controlled and disciplined environment of licensing, certification, procedures, air traffic service and navigation aids. Pilots operating within the system expect rapid response if they experience an airborne malfunction or any misadventure that causes a forced landing or crash. Pilots operating outside the system also expect quick assistance should they have difficulties. In all cases, the public at large, next-of-kin and the aviation community expect that an aircraft in trouble or missing will be located and the people assisted. Because of the skills and special capabilities required to locate a crash, reach the site and provide competent medical aid in difficult circumstances, it is normally only the government that can afford this SAR service. Because of historical evolution the Canadian Forces provides this service in the air world on behalf of DND and the federal government.

2.7 Aircraft are expensive to own and operate, consequently in general aviation they tend to be flown by those who can afford them or by small companies. These same people or their families usually are well aware of how to pressure the political system into extra action when aircraft are overdue. Therefore, expectations that government forces will respond to missing aircraft are often manifested by additional pressures through the political process. Missing aircraft and accidents are newsworthy events. People expect to be rescued if they are in trouble and request the service from their government. The result is that the public's expectations produce a situation where SAR operations are conducted in a glare of publicity and under pressures for action extended beyond that deemed prudent by SAR authorities. The public is not aware of the procedures whereby SAR response forces are notified, and tends therefore to draw the conclusions, when lives are lost, that SAR forces were too slow in arriving and that the fault was that of SAR forces and the federal government. The public then concludes that faster response could best be achieved by providing more SAR bases, or more aircraft or both.

Observations

2.8 Statistically, the air public and its operations in Canada may be characterized as follows for the calendar year 1980:

(a) There are approximately 24,500 Canadian aircraft of all kinds flown by about 92,000 air crew members (98% pilots).

(b) Of the above, 68% are private aircraft and 72% of the operators are civil, student or private pilots.

(c) As measured in flight plans (travel away from airports), the activity of this population of aircraft and operators, plus foreign registered aircraft, is approximately 1.8 million IFR flight plans and 362,000 VFR flight plans/flight notifications per annum.

(d) Only 11% of the licensed civilian pilots have current instrument ratings whereas virtually all the military pilots filling active flying positions hold current instrument ratings. These rated pilots fly about 90% of all trips where a flight plan has been filed.

(e) There is no measure of the number of aircraft which fly on company flight plans, flight itineraries or without any flight plan at all.

(f) Domestic military air traffic constitutes about 6% of the DOT IFR and VFR flight planned traffic.

(g) Approximately 125,000 movements of foreign registered aircraft crossed Canadian airspace on IFR plans (IFR rated pilots) in addition to domestic traffic.

(h) No separate measure is kept of VFR movements of foreign registered aircraft. They are included in Table 2-2C and 2-2D.

The Maritime Public

2.9 This public consists of the owners, ships officers, crews and the operators of commercial and private marine vehicles using Canadian waters. Cabinet has limited the federal SAR response resourcing for new vessels for this broad maritime public to those operators and vessels using the oceans bordering Canada, the Great Lakes and the St. Lawrence waterway. Prior to this Cabinet decision a rescue vessel had been provided on Lake Winnipeg and is still in place. The following table depicts the maritime public within these areas:

Table 2-4 - Canadian Marine Vessels

SAR Regions or Sub-Regions	Commercial Vessels	Licensed Fishing Vessels	Pleasure Craft*
St. John's	1,400	19,100	9,300
Halifax		8,300	
Quebec		2,900	40,000
Trenton		800	1,108,000
Victoria		7,300	200,000
Total	1,400	37,400	1,357,300
% of Total	0.1	2.7	97.2

* This is an estimate of the pleasure craft involved and it should be understood that as many of them are trailerable, they may not always be involved in waters as defined above.

Source: DFO & CMTA data

2.10 In addition to the figures shown in the above table, our proximity to the US and normal ocean transportation increases the number of vessels in each of the three categories. This occurs especially in the Great Lakes and on the Pacific coast.

Table 2-5 - Foreign Vessels Cleared by Canada Customs 1980/81

Passenger Vessel	7,670
Cargo Vessel	28,305
Ferries	56,271
Pleasure Craft	100,614
Total	192,860

Source: Department of National Revenue, Customs Excise

Expectations and Perceptions

2.11 With the exception of specific areas and the types of vessels under control of a VTM system, there is no general control on the movement of a vessel and Canadian waters may be transitted by anyone in any type of craft. Should these craft and their crews find themselves in a situation which could become more serious, they expect some form of assistance, as soon as possible. In the marine environment, failure of the government to provide timely assistance normally results in adverse publicity. As the numbers of uncertified vessels and uncertificated people at risk increases, it appears that the self-help tradition of the seasoned mariner is on the wane and the public now expects a government service to help them. This is provided in the marine environment by the DOT through the Search and Rescue Division of the Canadian Coast Guard.

2.12 The expectations and complacency of people at risk are heightened by the availability of SAR vehicles and the knowledge that pressure can be brought to bear both politically and publicly. Furthermore, members of the marine public who are uninformed about the SAR response system, and unaware of how the system is notified draw the conclusion that the responding force was at fault when lives were lost, and that more federal vessels and bases is the best way to improve response and avoid loss of life in the future.

Observations

2.13 From the above tables:

a) 97% of all vessels are pleasure craft, 3% are fishing vessels and 0.1% commercial vessels.

b) The distribution of the three categories of vessels is not uniform across the SAR Regions and Sub-Regions.

c) A very small percentage of pleasure craft operators has any qualification.

d) There is no control over the vast number of vessel movements.

SECTION 3 - THE SAR SCENE AND CLIENTELE

General

3.1 The general aviation and marine public and an overview of their activities has been defined in Section 2. Only some of these publics are involved in incidents, accidents, SAR incidents or (included in the latter category) life-threatening distresses. These operators, vessels and aircraft become the clientele of the SAR Program. They will be described in the following Tables and conclusions. The purpose of this profile is to understand the SAR problem, who experiences SAR incidents, what their causes are, when and where they happen and the causes of SAR related accidents. Definitions of these terms appear in the Glossary of definitions, page 113.

The SAR Universe

3.2 Historical records of SAR events exist largely in DND SARSTATS, DOT/CATA SAR related accident records and marine casualty records. Coast Guard Maritime SAR Emergency Centres (SARECS) respond to additional events, but the majority of these are not included in SARSTATS. SAR incidents in the SARSTATS record system are recorded in four categories : Air (A), Marine (M), Humanitarian (H), and Civil Assistance (C). Each of these groups is classified into five response events:

1 - Distress in which a SAR dedicated resource effort was used.
2 - Distress in which no dedicated SAR resource effort was used.
3 - Non distress events and false alarms.
4 - Temporary distress which required only monitoring.
5 - Reactivated cases.

Observations

3.3 Figure 3-1 displays fifteen years of data from SARSTATS 1966-1980 inclusive to illustrate SAR trends and events. Observations about the Canadian SAR situation in general are:

(a) The total number of incidents has increased continuously from 1966 to 1980.

(b) Actual air distresses have remained fewer than 200 per year over the past seven years and are fairly stable at approximately 150 annually since 1975.

(c) Actual marine distresses have remained below 450 per year over the past six years. There has been an increase of about 38 per year since 1976.

(d) All air incidents other than distresses have probably stabilized at approximately 2000 per year since 1975.

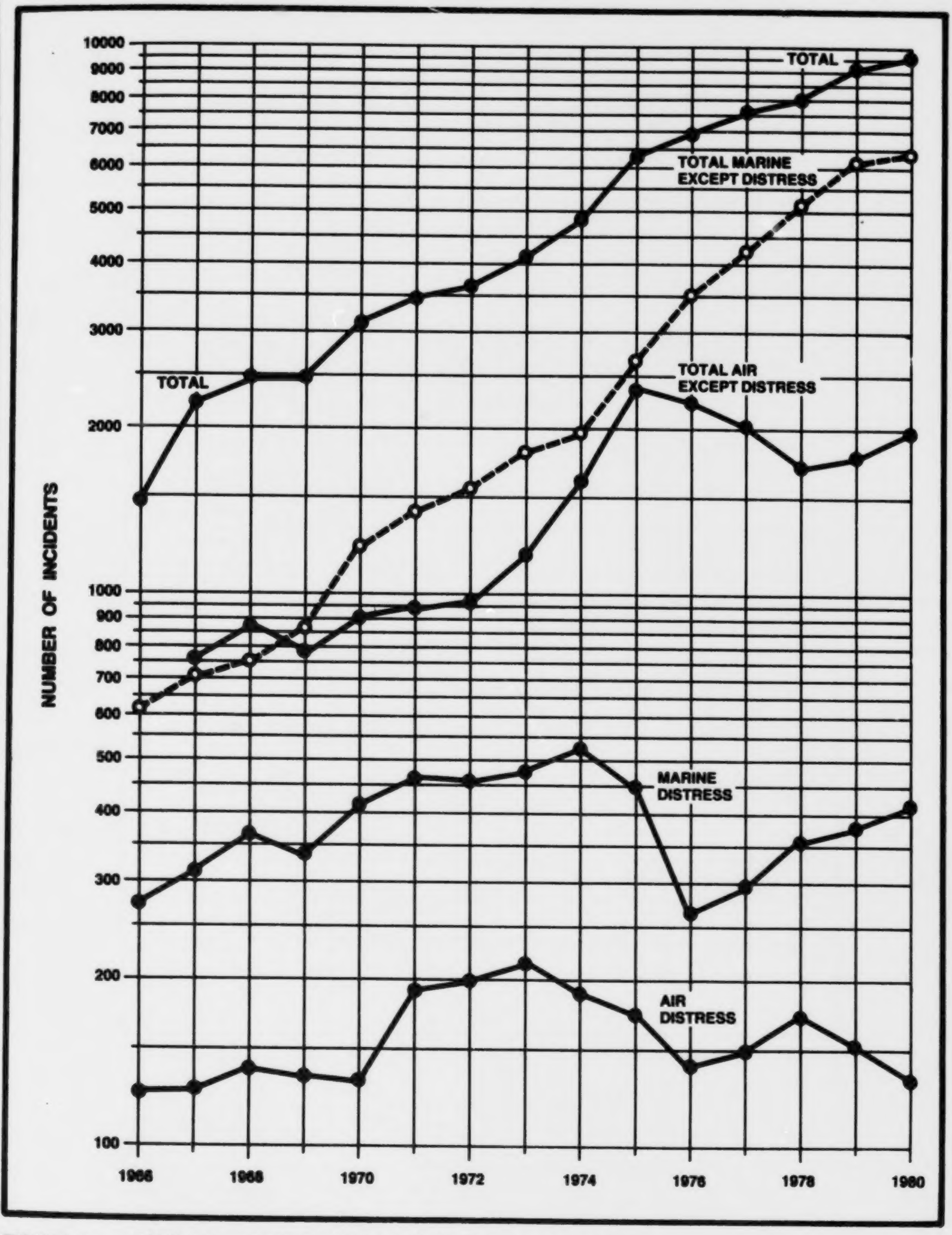


FIGURE 3-1 ANNUAL TRENDS OF SAR INCIDENTS (1966-1980)

(SOURCE: DND SARSTATS)

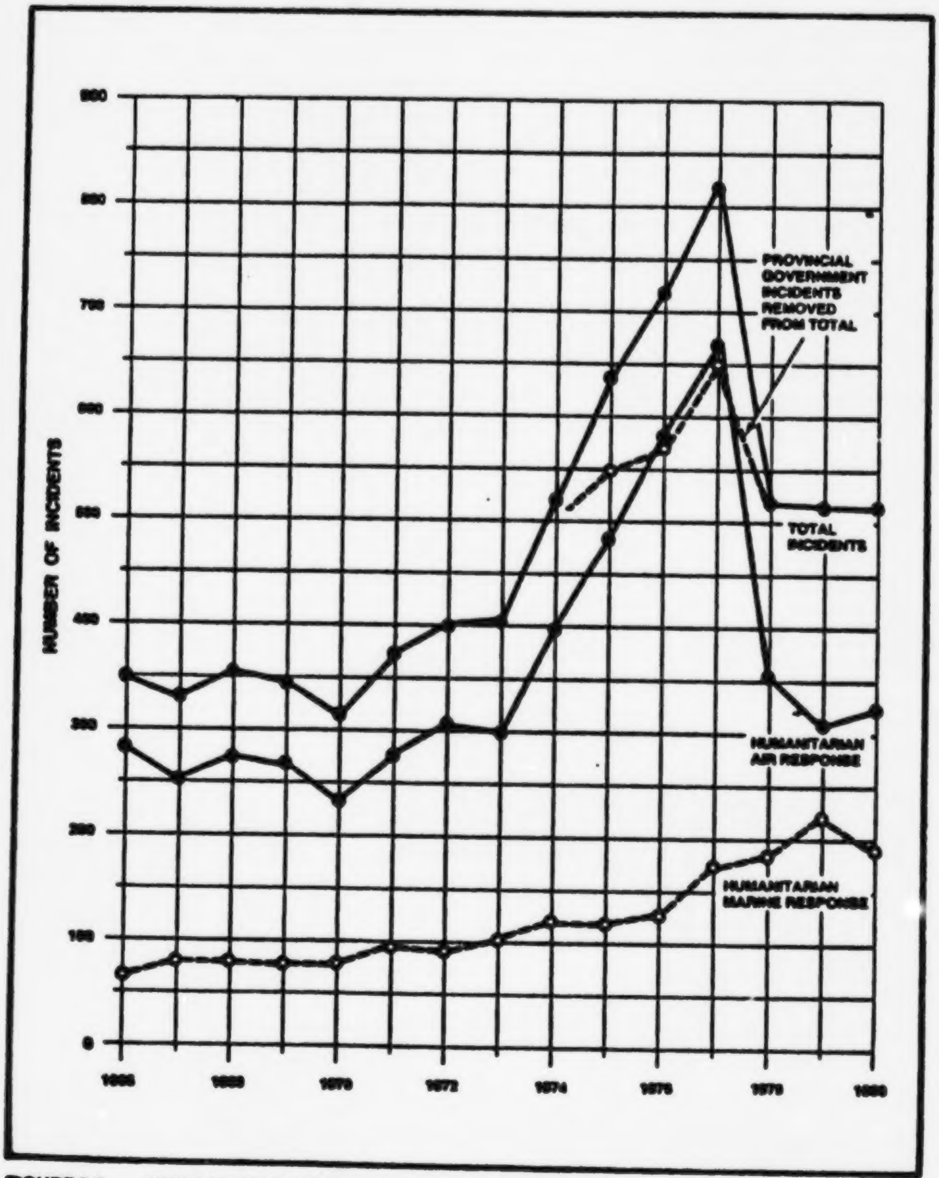


FIGURE 3-2 HUMANITARIAN INCIDENTS (MERCY) TRENDS 1966-1980 (SOURCE: DND SARSTATS)

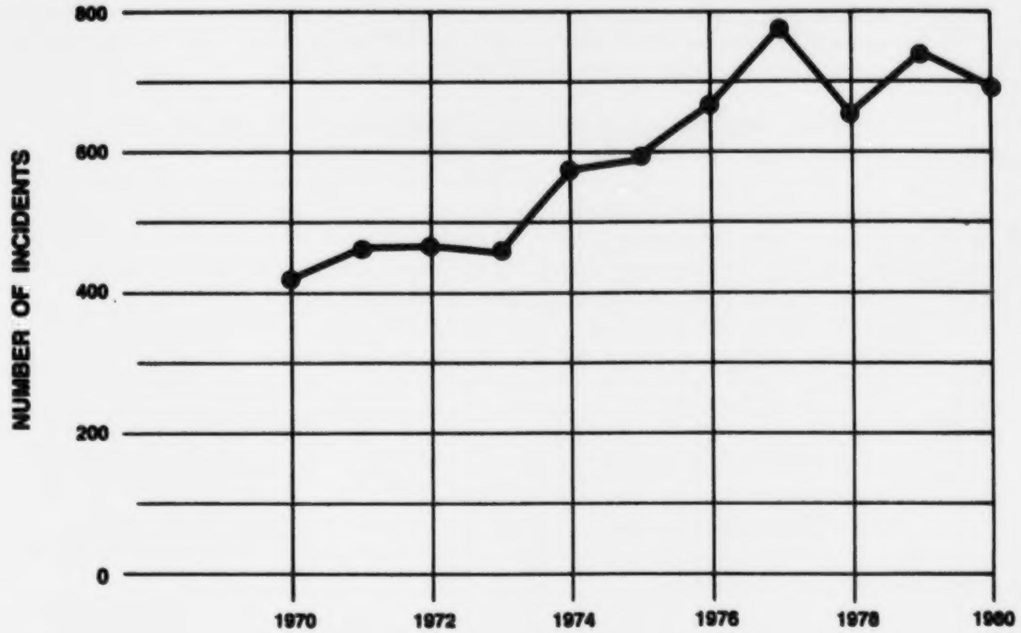


FIGURE 3-3 COMBINED TOTAL OF CIVIL AND HUMANITARIAN SAR RESPONSES 1970-1980 (NON-PRIMARY SAR ACTIVITY)

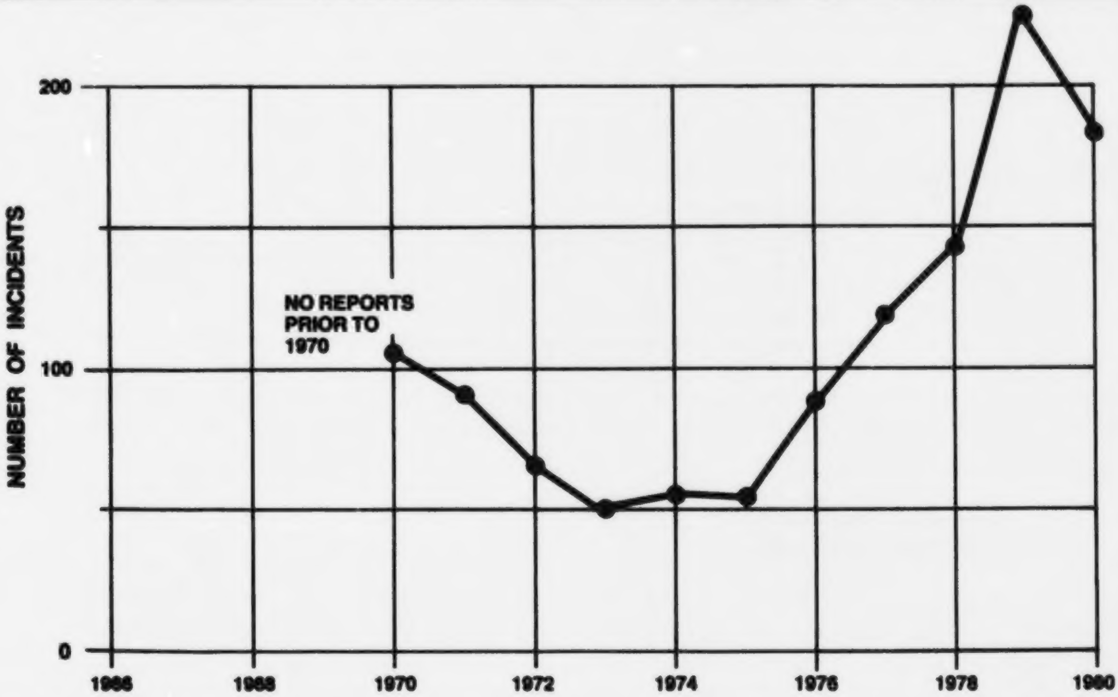


FIGURE 3-4 CIVIL ASSISTANCE INCIDENTS TRENDS 1970-1980 (SOURCE: DND SARSTATS)

(e) All reported marine incidents other than distresses have increased steadily since 1966 and at a rate greater than the total incident rate (20% annual average or 81% since 1976).

3.4 Figures 3-2, 3-3 and 3-4 show the status of humanitarian and civil assistance incidents:

(a) Humanitarian assistance responses, after peaking in 1977, stabilized at about 515 per year. The earlier rapid increase was driven by reporting provincial government air response actions which have virtually disappeared from the reporting system since 1977. The reported marine responses have increased 50% and the air responses have stabilized in the past five years.

(b) From Figure 3-4, the reported responses to civil incidents have increased 109% from 1976 to 1980.

(c) Humanitarian and civil incidents average about 9% of the annual total SAR incidents.

The SAR Scene

3.5 SAR activity nation-wide has a number of characteristics for the national and regional scenes. Air, marine and total SAR activities vary for each Region as do the activity rates by month, time of week and time of day. Within each Region, the geographic distribution of incidents occurs in patterns related to concentrations of air and marine traffic. These characteristics are described in the following tables based on the data of the years 1976 - 1980.

Observations

3.6 Tables 3-1 and 3-2 produce the following comments with respect to the occurrence and distribution of SAR incidents nationally and within SRRs:

(a) Air and marine distresses constitute only 6% of SAR incidents.

(b) Humanitarian and civil (non-air or marine craft) events constitute 9% of the national activity. The bulk of these incidents occur in the east and west regions encompassing coastal areas.

(c) Marine incidents are the majority of all incidents with 66% of the total, while air incidents constitute 25% of the total reported events.

(d) Air incidents are distributed approximately equally across all four Regions.

(e) Victoria Region is the most active nationally, with 51% of all incidents, 49% of the distresses and 60% of marine incidents,

TABLE 3-1 - OCCURRENCE OF INCIDENTS BY REGION

REGION	INCIDENT TYPE	CALENDAR YEAR					TOTAL	PERCENT OF TOTAL	
		1976	1977	1978	1979	1980	1976-80	REGION	NATIONAL
VICTORIA	DISTRESS - AIR	42	47	63	58	58	268	1.3	
	- MARINE	139	142	202	205	243	931	4.4	
	OTHER - AIR	531	465	426	511	613	2546	11.9	
	- MARINE	2197	2688	3145	3782	3578	15390	72.2	
	HUMANITARIAN & CIVIL	564	642	318	381	284	2189	10.3	
	TOTAL	3473	3984	4154	4937	4776	21324		51.4
EDMONTON	DISTRESS - AIR	33	38	32	33	20	156	5.7	
	- MARINE	0	0	2	1	5	8	0.3	
	OTHER - AIR	588	525	393	383	456	2345	85.1	
	- MARINE	14	20	39	47	85	205	7.4	
	HUMANITARIAN & CIVIL	19	5	11	3	3	41	1.5	
	TOTAL	654	588	477	467	569	2755		6.6
TRENTON	DISTRESS - AIR	43	47	53	49	41	233	2.9	
	- MARINE	73	116	102	109	110	510	6.3	
	OTHER - AIR	472	479	396	427	455	2229	27.3	
	- MARINE	473	713	890	1221	1503	4800	58.9	
	HUMANITARIAN & CIVIL	37	72	86	70	115	380	4.7	
	TOTAL	1098	1427	1527	1876	2224	8152		19.6
HALIFAX	DISTRESS - AIR	20	16	21	11	12	80	0.9	
	- MARINE	53	40	50	62	60	265	2.9	
	OTHER - AIR	621	553	493	473	468	2608	28.1	
	- MARINE	844	858	1045	1139	1217	5103	54.9	
	HUMANITARIAN & CIVIL	187	219	245	286	295	1232	13.3	
	TOTAL	1725	1686	1854	1971	2052	9288		22.4
NATIONAL	DISTRESS - AIR	138	148	169	151	131	737	1.8	
	- MARINE	265	298	356	377	418	1714	4.1	
	OTHER - AIR	2212	2022	1708	1794	1992	9728	23.4	
	- MARINE	3528	4279	5119	6189	6383	25498	61.4	
	HUMANITARIAN & CIVIL	807	938	660	740	697	3842	9.3	
	TOTAL	6950	7685	8012	9251	9621	41519		

(SOURCE: DND SARSTATS)

TABLE 3-2 - DISTRIBUTION OF INCIDENTS BY REGION

INCIDENTS	NATIONAL TOTALS 1976-1980	REGIONAL PERCENTAGE OF NATIONAL TOTAL				PERCENT OF NATIONAL TOTAL
		VICTORIA	EDMONTON	TRENTON	HALIFAX	
AIR						
DISTRESS	737	36.4	21.2	31.6	10.9	1.8
OTHER	9728	26.2	24.1	22.9	26.8	23.4
TOTAL	10465	26.9	23.9	23.5	25.7	25.2
MARINE						
DISTRESS	1714	54.3	0.5	29.8	15.5	4.1
OTHER	25498	60.4	0.8	18.8	20.0	61.4
TOTAL	27212	60.0	0.8	19.5	19.7	65.5
HUMANITARIAN & CIVIL	3842	57.0	1.1	9.9	32.0	9.3
TOTALS	41519	51.4	6.6	19.6	22.4	100.0
ALL DISTRESSES	2451	49.0	6.7	30.3	14.0	5.9

(SOURCE: DND SARSTATS)

three times as many as either of the other two marine oriented Regions.

(f) If an aircraft or vessel experiences a SAR incident in Canada, the probability that it will be a distress is greater in the Victoria and Trenton Regions.

(g) Trenton and Halifax Regions are roughly equal in total air and marine incidents although Trenton experiences three times as many air distresses and twice as many marine distresses.

(h) 91% of the Edmonton Region's incidents are air oriented.

SAR Incident Time Events
Monthly Occurrence

3.7 SAR incidents are seasonal and cyclical owing to the changes in the marine and air publics' activities which result from our seasonal variation in climate. Using air and marine distresses as an indicator, the monthly variation in SAR events is shown in Tables 3-3A and B and Figure 3-5.

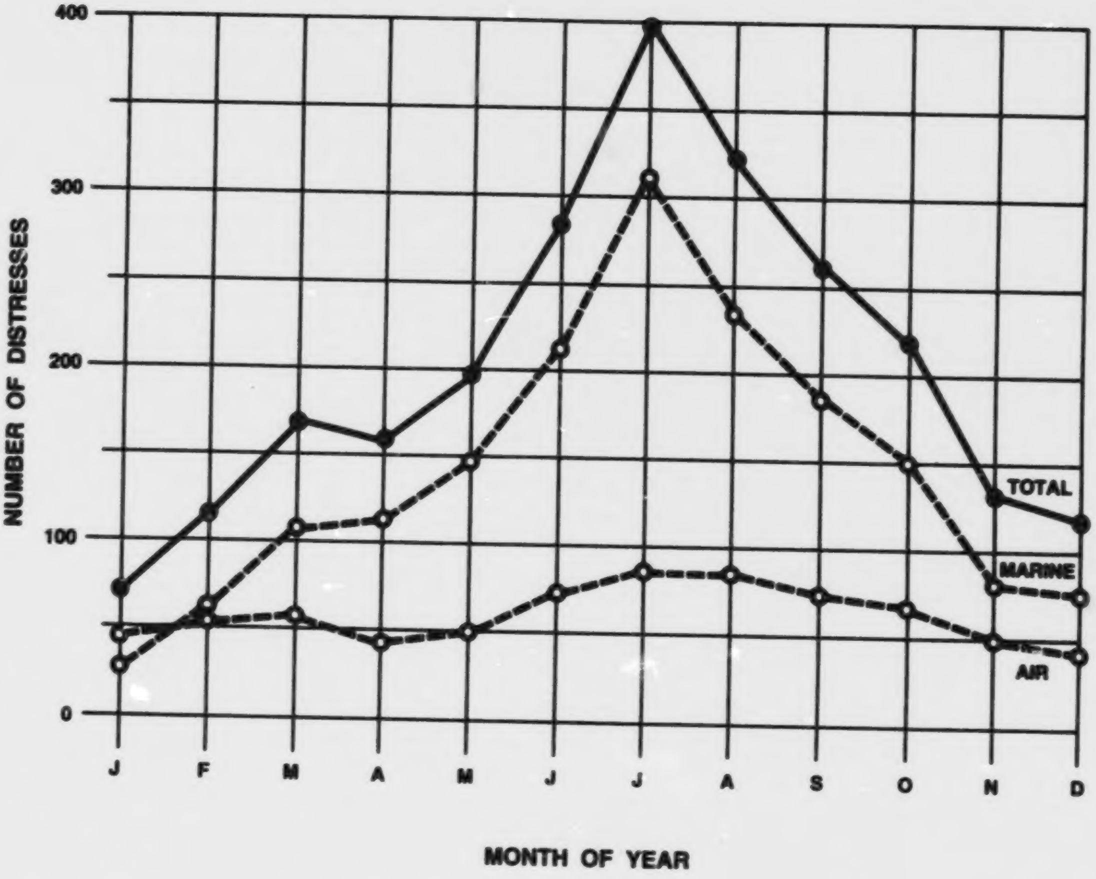


FIGURE 3-5 OCCURRENCE OF DISTRESSES BY MONTH OF YEAR 1976-1980

(SOURCE: DND SARSTATS)

TABLE 3-3A - OCCURRENCE OF DISTRESS INCIDENTS BY MONTH

1976 - 1980

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
VICTORIA													
AIR	16	20	21	14	17	22	41	33	35	21	17	11	268
MARINE	15	46	87	59	73	107	139	121	98	93	46	47	931
EDMONTON													
AIR	8	11	13	16	14	23	7	15	9	16	15	9	156
MARINE	0	0	0	0	3	0	0	1	2	2	0	0	8
TRENTON													
AIR	16	18	17	13	17	23	30	23	24	21	16	15	233
MARINE	2	1	4	20	49	83	145	94	61	30	12	9	510
HALIFAX													
AIR	5	5	8	3	3	5	9	15	6	11	2	8	80
MARINE	12	15	19	35	23	23	27	19	25	24	24	19	265
NATIONAL TOTALS													
AIR	45	54	59	46	51	73	87	86	74	69	50	43	737
MARINE	29	62	110	114	148	213	311	235	186	149	82	75	1714
TOTAL	74	116	169	160	199	286	398	321	260	218	132	118	2451
% OF TOTAL	2.9	4.7	6.9	6.5	8.1	11.7	16.2	13.1	10.6	8.9	5.4	4.8	

TABLE 3-3B - PERCENTAGE OF DISTRESS DISTRIBUTION BY MONTH

1976 - 1980

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	NO. OF INCIDENTS
VICTORIA	2.6	5.5	9.0	6.1	7.5	10.8	15.0	12.8	11.1	9.5	5.3	4.8	1199
EDMONTON	4.9	6.7	7.9	9.8	10.4	14.0	4.3	9.8	6.7	11.0	9.1	5.5	164
TRENTON	2.4	2.6	2.8	4.4	7.5	14.3	23.6	15.7	11.4	6.9	3.8	3.2	743
HALIFAX	4.9	5.8	7.8	11.0	7.5	8.1	10.4	9.9	9.0	10.1	7.5	7.8	345

(SOURCE: DND SARSTATS)

Observations

3.8 The display of monthly SAR information leads to the following conclusions:

(a) The six month period of May to October is the busiest SAR activity period with the peak occurring during the month of July.

(b) In the summer months, air distresses increase about 50% over the minimum levels although seasonal peaks are far more gradual than those of the marine world.

(c) Marine distresses triple during the summer months. Marine incidents are the main factor causing the seasonal and monthly variation of SAR distresses.

(d) The Trenton Region shows the greatest seasonal variation with approximately two-thirds of its distresses occurring between June and September, a reflection of the seasonal recreational boating activity on the Great Lakes and St. Lawrence River Waterways.

(e) The distress occurrences in the Halifax and Edmonton Regions remain relatively constant during the year.

Day of the Week Occurrence

3.9 Tables 3-4 A & B, 3-5, and 3-6 illustrate the occurrence of distresses and air non-distresses through the day of the week by Region. Table 3-6 analyzes the distribution of all incidents for 1980 to provide a picture of the weekly flow of SAR activity. Finally, Figures 3-6 and 3-7 display the distribution of incidents in 1980 and the specifics of the marine events which largely cause the weekly variation.

Observations

3.10 The following points are observed from the distribution of incidents by the day of the week:

(a) The variation of occurrence of incidents during the week is caused mainly by marine distress and non-distress incidents.

(b) The most active days are Saturday, Sunday and Monday corresponding to weekend and long weekend periods.

(c) Trenton and Victoria Regions, where the most pleasure boating takes place, are the locations of the incidents which cause the largest weekend increase.

(d) Air, humanitarian and civil incidents are distributed evenly throughout the week with only a slight weekend increase.

(e) The Halifax Region is more active during the week with fewer incidents on the weekend. This reflects the fact that fishing boats, the source of most of the Halifax incidents, tend to be out less on weekends.

TABLE 3-4A

DISTRESS OCCURRENCE BY DAY OF THE WEEK

1976-1980

REGION	MON	TUES	WED	THURS	FRI	SAT	SUN
VICTORIA							
Air	39	36	39	42	34	38	40
Marine	130	115	112	103	110	149	212
EDMONTON							
Air	25	13	18	25	23	25	27
Marine	1	1	1	2	-	1	2
TRENTON							
Air	29	29	30	41	38	38	28
Marine	76	60	50	68	54	100	102
HALIFAX							
Air	9	9	15	13	13	8	13
Marine	38	41	30	38	47	32	39
NATIONAL							
Air	102	87	102	121	108	109	108
Marine	245	217	193	211	211	282	355
TOTAL	347	304	295	332	319	391	463

(SOURCE: DND SARSTATS)

TABLE 3-4B

DISTRIBUTION OF DISTRESSES BY DAY OF WEEK

1976-1980 (PERCENTAGES)

REGION	MON	TUES	WED	THURS	FRI	SAT	SUN	TOTAL DISTRESSES Number	Percent
VICTORIA	14.1	12.6	12.6	12.1	12.0	15.6	21.0	1,199	(48.9)
EDMONTON	15.9	8.5	11.6	16.5	14.0	15.8	17.7	164	(6.7)
TRENTON	14.0	12.0	10.8	14.7	12.4	18.6	17.5	743	(30.3)
HALIFAX	13.6	14.5	13.0	14.8	17.4	11.6	15.1	345	(14.1)
NATIONAL									
Air	13.8	11.8	13.8	16.4	14.7	14.8	14.7	737	(30.1)
Marine	14.3	12.7	11.3	12.3	12.3	16.4	20.7	1,714	(69.9)
TOTAL	14.2	12.4	12.0	13.6	13.0	15.9	18.9	2,451	

(SOURCE: DND SARSTATS)

TABLE 3-5

AIR NON-DISTRESS OCCURRENCE BY DAY OF THE WEEK

(1976-80)

	MON	TUES	WED	THURS	FRI	SAT	SUN	TOTAL
Victoria	385	349	380	336	368	388	340	2,546
Trenton	280	296	257	334	350	373	339	2,229
Edmonton	323	324	295	318	341	372	371	2,344
Halifax	382	336	379	429	386	365	331	2,608
TOTAL	1,370	1,305	1,311	1,417	1,445	1,498	1,381	9,727
% of Grand Total	14.1	13.4	13.5	14.6	14.9	15.3	14.2	

TABLE 3-6

SAR INCIDENT OCCURRENCE BY DAY OF WEEK - 1980

REGION	MON.	TUES.	WED.	THURS.	FRI.	SAT.	SUN.	TOTALS
VICTORIA								
Air								
Distress	5	4	6	11	11	10	11	58
Non-Distress	109	78	95	74	83	101	73	613
- Total	114	82	101	85	94	111	84	671
Marine								
Distress	29	28	28	30	24	32	72	243
Non-Distress	602	472	415	358	413	554	764	3578
- Total	631	500	443	388	437	586	836	3821
Humanitarian	23	26	29	25	27	31	27	188
Civil	11	15	15	8	6	22	19	96
- Region Total	779	623	588	506	564	750	966	4776
EDMONTON								
Air								
Distress	2	3	3	4	4	3	1	20
Non-Distress	65	61	54	60	58	75	83	456
- Total	67	64	57	64	62	78	84	476
Marine								
Distress	1	1	0	1	0	1	1	5
Non-Distress	10	8	5	5	15	18	24	85
- Total	11	9	5	6	15	19	25	90
Humanitarian	0	1	0	0	0	0	0	1
Civil	1	0	0	1	0	0	0	2
- Region Total	79	74	62	71	77	97	109	569
TRENTON								
Air								
Distress	3	4	6	8	6	6	8	41
Non-Distress	58	47	61	68	70	82	69	455
- Total	61	51	67	76	76	88	77	496
Marine								
Distress	15	8	17	15	10	20	25	110
Non-Distress	188	144	144	151	167	325	384	1503
- Total	203	152	161	166	177	345	409	1613
Humanitarian	11	10	9	11	6	12	13	72
Civil	2	4	7	6	6	7	11	43
- Region Total	277	217	244	259	265	452	510	2224
HALIFAX								
Air								
Distress	2	3	4	0	0	1	2	12
Non-Distress	60	63	74	71	68	71	61	468
- Total	62	66	78	71	68	72	63	480
Marine								
Distress	9	9	9	7	15	2	9	60
Non-Distress	178	186	177	156	186	181	153	1217
- Total	187	195	186	163	201	183	162	1277
Humanitarian	28	42	30	40	39	43	30	252
Civil	11	6	2	10	5	5	4	43
- Region Total	288	309	296	284	313	303	259	2052
National Totals	1423	1223	1190	1120	1219	1602	1844	9621

SOURCE: DND SARSTATS

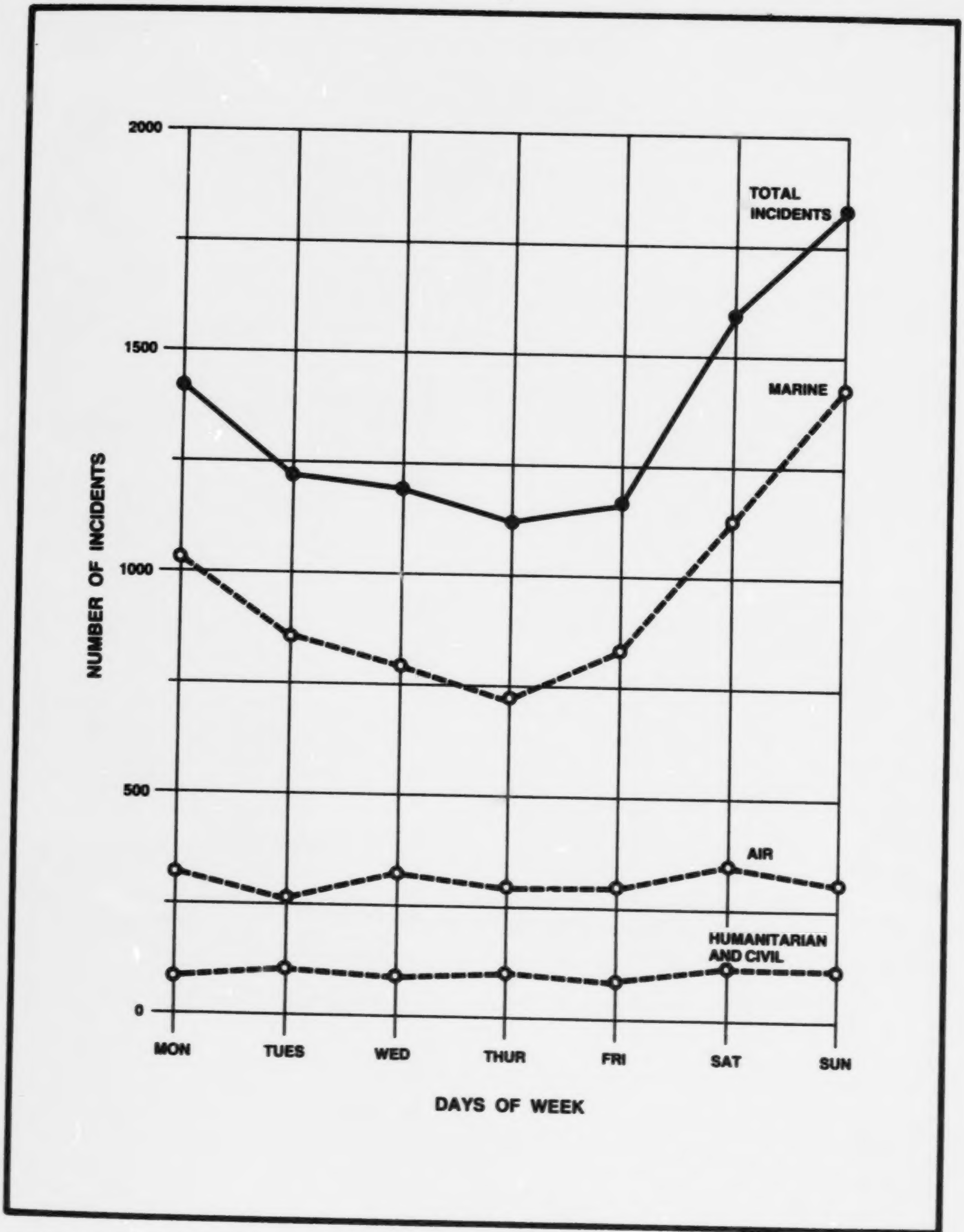


FIGURE 3-6 DISTRIBUTION OF INCIDENTS BY DAY OF WEEK 1980

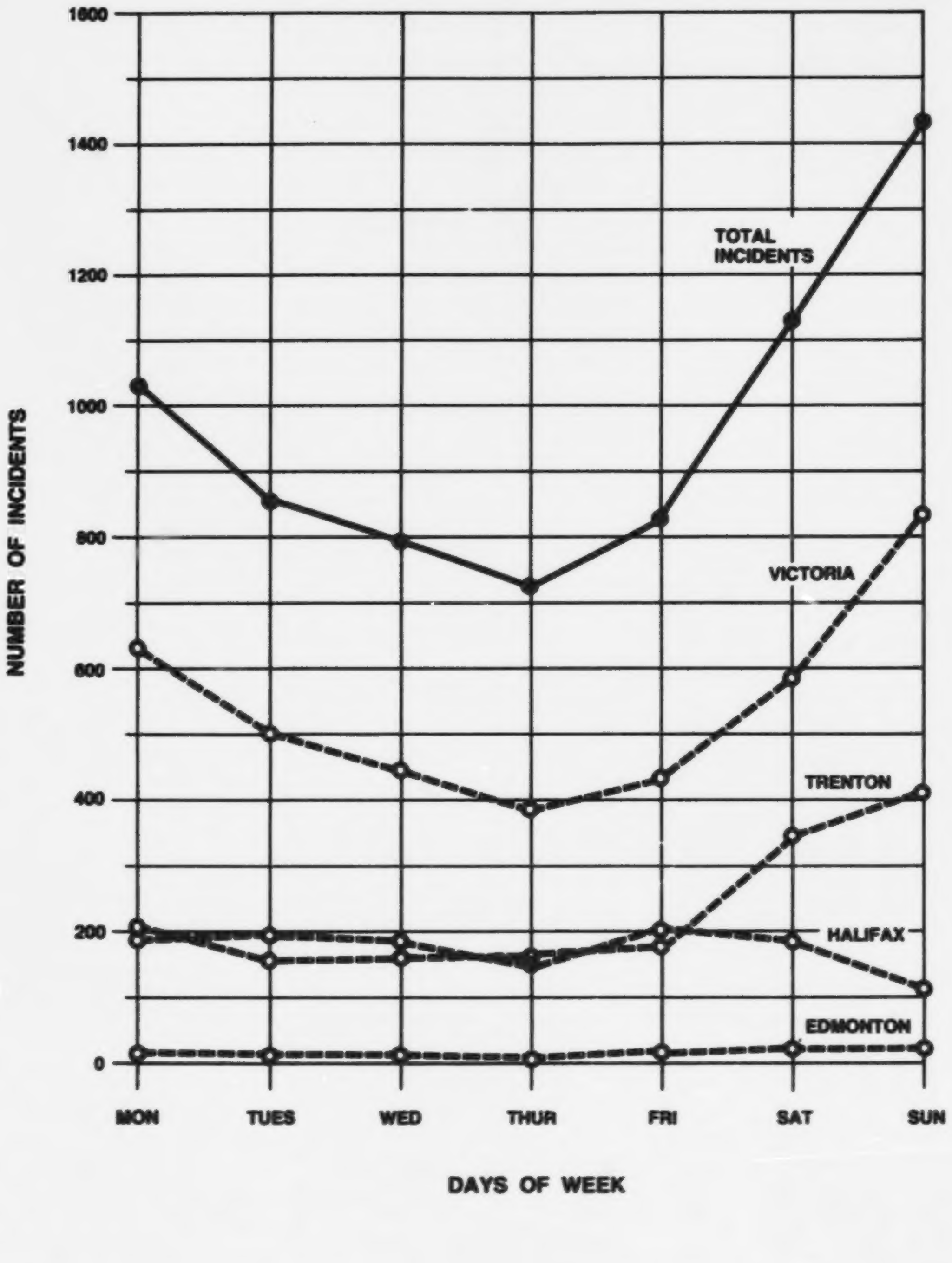


FIGURE 3-7 DISTRIBUTION OF MARINE INCIDENTS BY DAY OF WEEK 1980

Time of Day Occurrence

3.11 Distribution of occurrences of SAR distresses in relation to local time of day at the RCC are displayed in Tables 3-7 A & B and Figure 3-8.

TABLE 3-7A - OCCURRENCE OF DISTRESS INCIDENTS BY LOCAL TIME OF DAY

1976 - 1980

REGION	00-02	02-04	04-06	06-08	08-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	TOTAL DISTRESSES
VICTORIA													
AIR	6	0	1	3	16	36	36	45	46	33	26	20	268
MARINE	38	38	19	25	57	72	145	147	142	103	87	58	931
TOTAL	44	38	20	28	73	108	181	192	188	136	113	78	1199
EDMONTON													
AIR	9	5	2	3	7	11	22	28	14	23	19	13	156
MARINE	0	0	0	1	0	1	0	4	0	1	0	1	8
TOTAL	9	5	2	4	7	12	22	32	14	24	19	14	164
TRENTON													
AIR	8	1	3	4	11	22	36	38	34	35	29	12	233
MARINE	26	23	9	16	33	44	41	66	73	73	59	47	510
TOTAL	34	24	12	20	44	66	77	104	107	108	88	59	743
HALIFAX													
AIR	0	1	0	2	7	5	7	19	12	11	10	6	80
MARINE	17	11	7	9	17	27	18	20	32	38	34	35	265
TOTAL	17	12	7	11	24	32	25	39	44	49	44	41	345
NATIONAL													
AIR	23	7	6	12	41	74	101	130	106	102	84	51	737
MARINE	81	72	35	51	107	144	204	237	247	215	180	141	1714
TOTAL	104	79	41	63	148	218	305	367	353	317	264	192	2451

TABLE 3-7B - DISTRIBUTION OF DISTRESSES BY LOCAL TIME OF DAY IN PERCENTAGES

1976 - 1980

REGION	00-02	02-04	04-06	06-08	08-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	TOTAL DISTRESSES
VICTORIA	3.7	3.2	1.7	2.3	6.1	9.0	15.1	16.0	15.7	11.3	9.4	6.5	1199
EDMONTON	5.5	3.0	1.2	2.4	4.3	7.3	13.4	19.5	8.5	14.6	11.6	8.5	164
TRENTON	4.6	3.2	1.6	2.7	5.9	8.9	10.4	14.0	14.4	14.5	11.8	7.9	743
HALIFAX	4.9	3.5	2.0	3.2	7.0	9.3	7.2	11.3	12.0	14.2	12.8	11.9	345
NATIONAL AIR	3.1	0.9	0.8	1.6	5.6	10.0	13.7	17.6	14.4	13.8	11.4	6.9	737
MARINE	4.7	4.2	2.4	3.0	6.2	8.4	11.9	13.8	14.4	12.5	10.5	8.2	1714
TOTAL	4.2	3.2	1.7	2.6	6.0	8.9	12.4	15.0	14.4	12.9	10.8	7.8	2451

(SOURCE: DND SARSTATS)

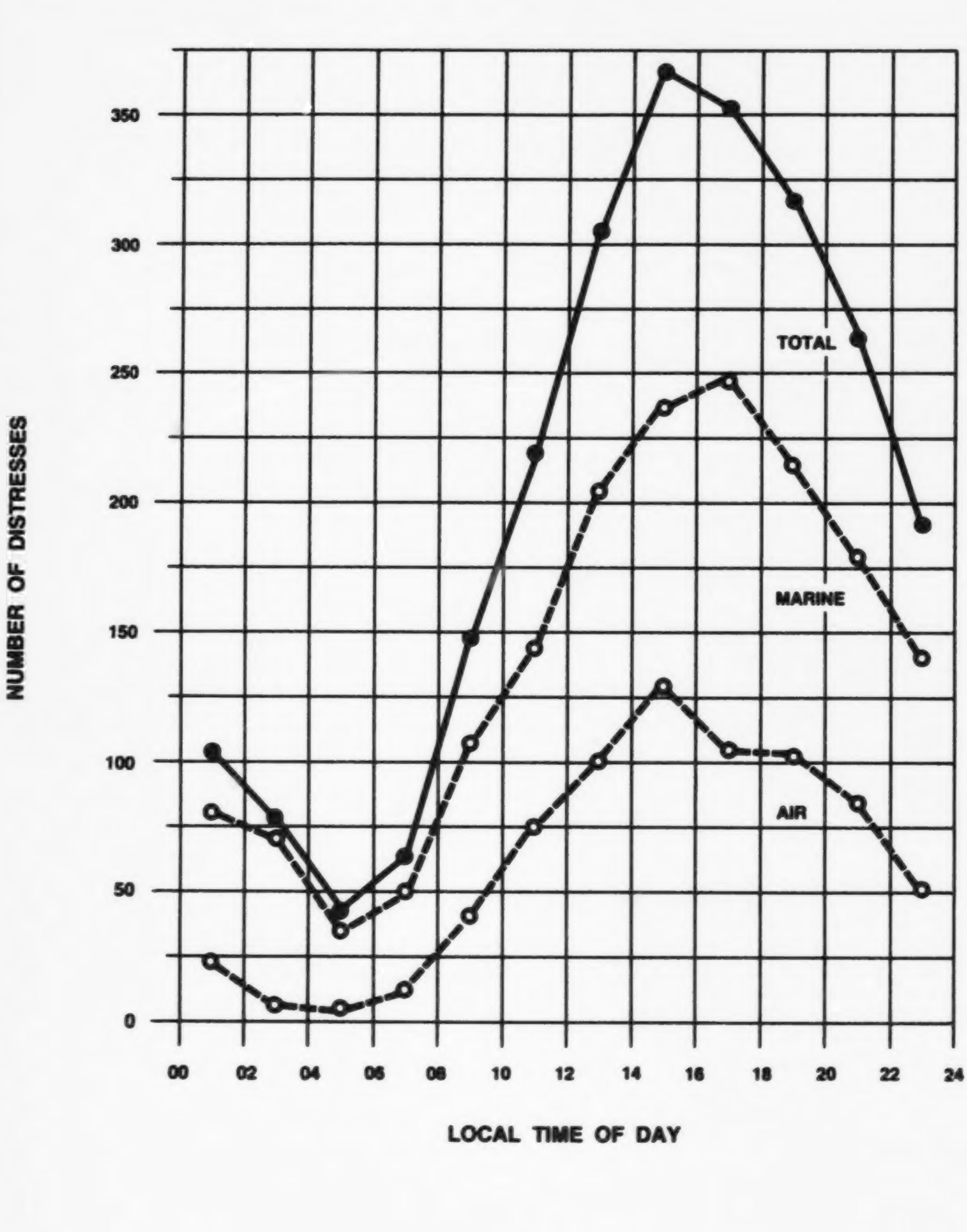


FIGURE 3-8 OCCURRENCE OF DISTRESS INCIDENTS BY LOCAL TIME OF DAY 1976-1980 (SOURCE: DND SARSTATS)

Observations

3.12 Examination of these displays indicates the following:

(a) Distresses peak according to the daily cycle of human activity. Peak occurrence (74% of the distresses) is in the 1000 to 2200 hours local time period.

(b) The frequencies of air and marine distresses parallel each other closely at all hours.

(c) Distresses in the Victoria Region peak quickly in the afternoon, whereas Halifax distresses peak in the early evening.

Geographical Distribution of Incidents Within Regions

(Note: Plotting of these is being done by Aeronautical and Hydrographic Charting. Until these are ready, data provided by the Department of National Defence has been used.

3.13 The distribution of distress incidents relative to the SAR aircraft bases is shown in Tables 3-8 A & B for the period 1976 to 1978

3.14 Figures 3-9A to 3-9D display air and marine distress locations for all or part of the period 1976 - 1980.

(a) Figure 3-9A - Air Distresses. The Chart displays the occurrence of distresses nationally on a grid of 2° of latitude and longitude to a side. Each circle represents the number of distresses per block (about 120 nautical miles N-S by 75 nautical miles E-W).

(b) Figures 3-9B,C & D and Table 3-9 - Marine Distresses. The occurrence of distresses is displayed by marine sub-area for Victoria, Trenton and Halifax Regions. The circled numbers indicate the 1976-1980 total for each sub area by type of distress. Also noted are those incidents occurring in United States areas and in Canadian inland areas.

3.15 An examination of the geographical distribution of incidents determines the following conclusions:

(a) Air and marine distresses occur most frequently in those areas with the greatest concentration of air and marine traffic. This is useful for predicting the need for SAR resources.

(b) Approximately 80% or more of all distresses occur within 400 miles of a SAR aircraft base in all regions except Edmonton. This corresponds to two or less flying hours for a fixed wing aircraft and is beyond the radius of action of most helicopters.

TABLE 3-8A DISTRIBUTION OF CASES RELATIVE TO DISTANCE FROM SAR BASES 1976 - 1978

REGION	DISTRESS INCIDENTS		AVERAGE DISTANCE INCIDENT TO SAR BASE	DISTRIBUTION OF CASES TO DISTANCE FROM SAR AIR BASE					
	TYPE	NUMBER		0/200NM	200/400NM	400/600NM	600/800NM	800/1000NM	1000NM+
VICTORIA	AIR	151	283 NM	80	44	16	10	0	1
	MARINE	483	118 NM	435	40	8	0	0	
EDMONTON	AIR	99	484 NM	14	28	28	15	5	7
	MARINE	2	780 NM	0	0	1	0	1	0
TRENTON	AIR	143	313 NM	50	60	20	8	2	3
	MARINE	291	200 NM	169	101	20	0	0	1
HALIFAX	AIR	56	352 NM	15	18	16	3	4	0
	MARINE	142	250 NM	80	41	8	0	11	2

TABLE 3-8B - GEOGRAPHIC DISTRIBUTION OF DISTRESS INCIDENTS 1976 - 1978

REGION	NUMBER OF DISTRESS CASES	PERCENTAGE OF CASES RELATIVE TO DISTANCE FROM SAR AIR BASES			
		0/200 NM	200/400 NM	400/600 NM	600 NM+
VICTORIA	634	81.2	13.2	3.9	1.7
EDMONTON	101	14.1	28.3	29.3	28.3
TRENTON	434	50.5	37.1	9.2	3.2
HALIFAX	198	48.0	29.8	12.1	10.1

FIGURE 3-9A LOCATION OF AIR DISTRESS INCIDENTS
1976-1978

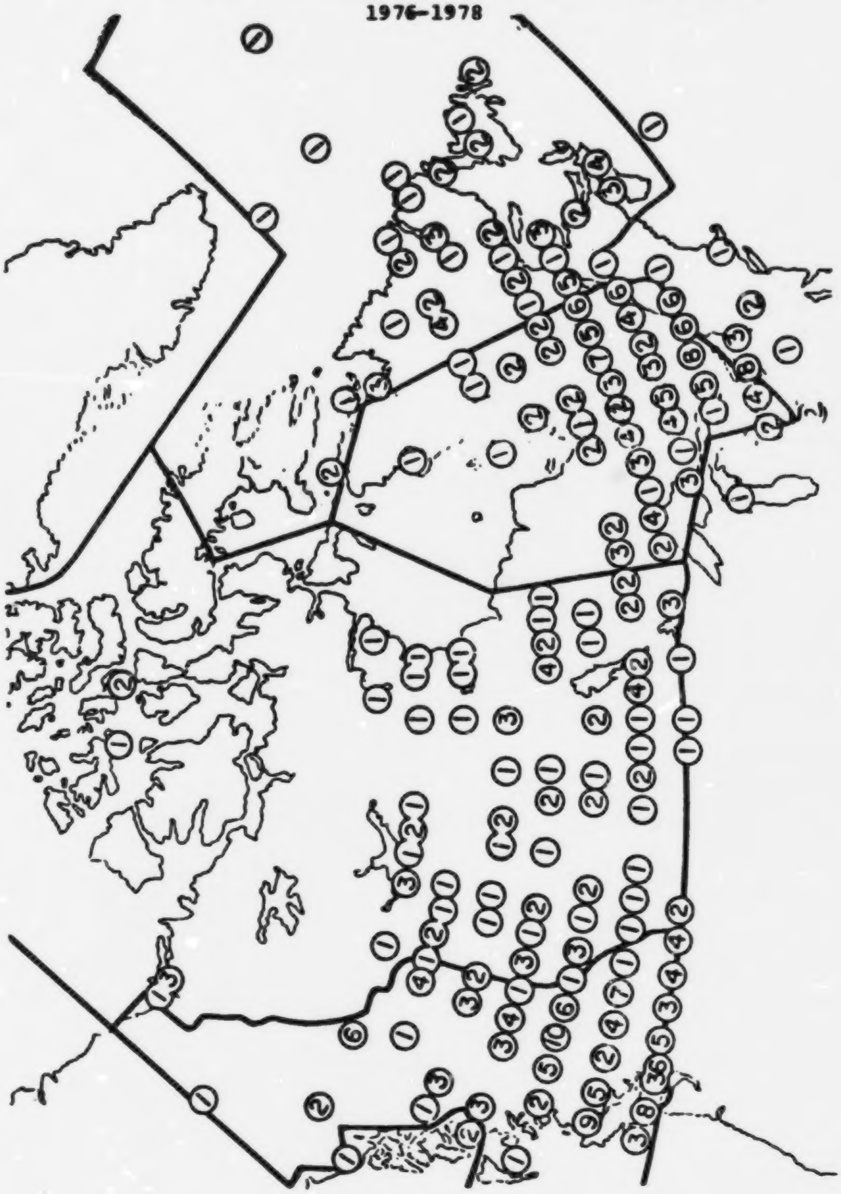


FIGURE 3-9B LOCATION OF MARINE
DISTRESS INCIDENTS 1976 - 1980

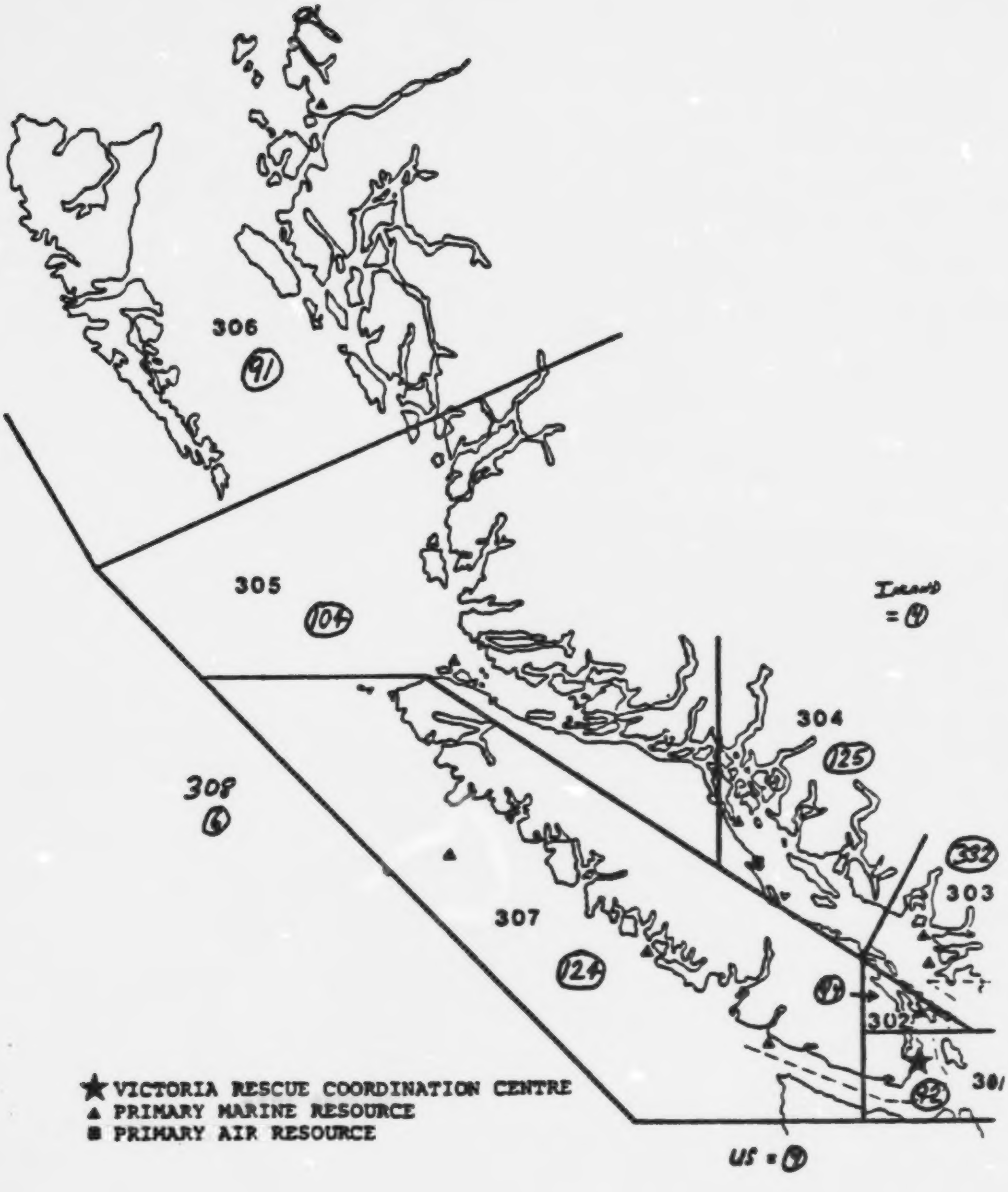

306
91
305
104
Inland
= 4
304
125
332
303
308
6
307
124
45
302
301
42
US = 9
★ VICTORIA RESCUE COORDINATION CENTRE
▲ PRIMARY MARINE RESOURCE
■ PRIMARY AIR RESOURCE

FIGURE 3-9C LOCATION OF MARINE DISTRESS INCIDENTS
1976-1980

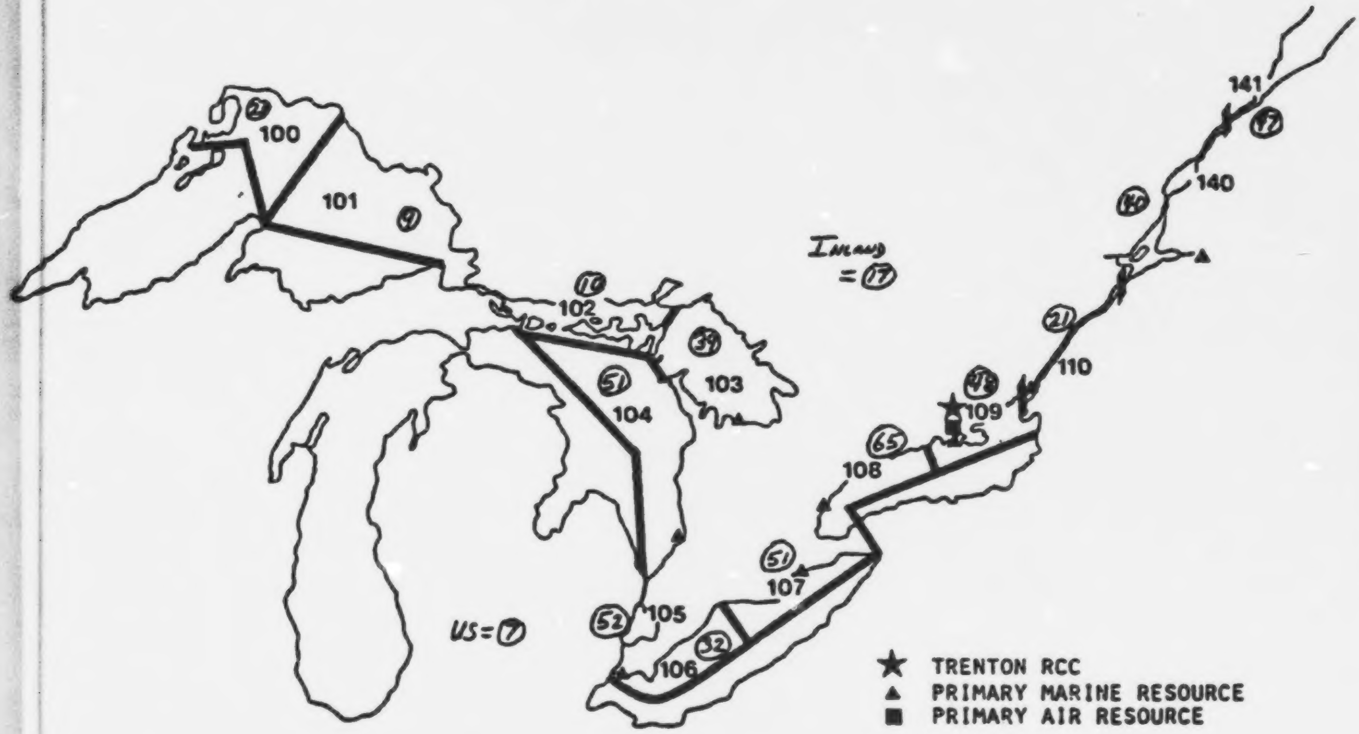

27
100
101
9
Inland
= 17
16
102
39
103
51
104
65
108
48
109
110
21
40
140
141
97
51
107
52
105
32
106
US = 7
★ TRENTON RCC
▲ PRIMARY MARINE RESOURCE
■ PRIMARY AIR RESOURCE

FIGURE 3-9D LOCATION OF MARINE DISTRESS
INCIDENTS 1976 - 1980

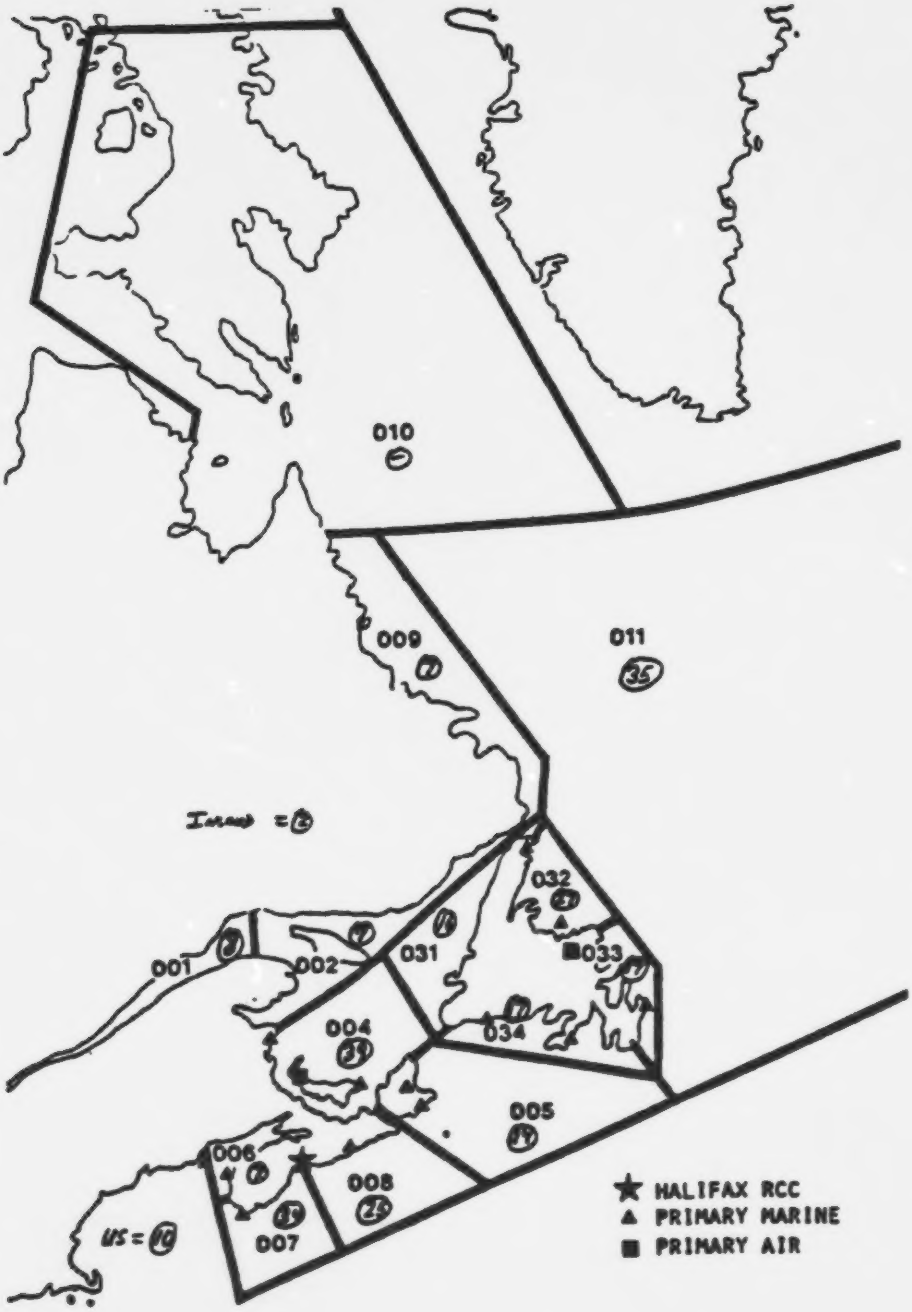

010
009
011
35
Inland = 2
032
031
033
001
002
004
034
005
006
008
007
US = 10
★ HALIFAX RCC
▲ PRIMARY MARINE
■ PRIMARY AIR

TABLE 3-9 1976-80 DISTRESS INCIDENTS BY SUB AREA

REGION	1976	1977	1978	1979	1980	TOTAL	*A %	*B %
HALIFAX								
001	1	-	3	-	4	8	3	
002	-	2	1	1	3	7	3	
004	2	3	11	11	12	39	15	
005	3	1	5	3	2	14	5	
006	-	1	1	-	5	7	3	
007	9	5	7	4	9	34	13	
008	3	3	4	10	5	25	9	
009	2	-	3	1	1	7	3	
010	-	-	-	-	-	-	-	
011	10	7	3	9	6	35	13	
031	3	3	3	6	1	16	6	
032	3	6	4	11	3	27	10	
033	6	6	1	2	2	17	6	
034	4	-	3	4	6	17	6	
Inland	1	-	1	-	-	2	1	
US	6	3	-	-	1	10	4	
TOTAL	53	40	50	62	60	265		113
TRENTON								
100	3	6	5	4	3	21	4	
101	-	3	1	3	2	9	2	
102	1	3	-	3	3	10	2	
103	8	10	8	7	6	39	8	
104	8	9	7	16	11	51	10	
105	6	11	11	11	13	52	10	
106	9	7	8	2	6	32	6	
107	13	10	10	10	8	51	10	
108	9	16	18	11	11	65	13	
109	5	7	15	10	11	48	10	
110	7	2	-	7	5	21	4	
140	1	9	7	11	12	40	8	
141	-	12	10	11	14	47	9	
Inland	3	9	1	1	3	17	3	
US	-	2	1	2	2	7	1	
TOTAL	73	116	102	109	110	510		151
VICTORIA								
301	10	12	22	26	22	92	10	
302	7	7	11	13	6	44	5	
303	53	58	70	73	78	332	36	
304	19	14	25	32	35	125	13	
305	16	22	24	13	29	104	11	
306	14	10	14	19	34	91	10	
307	18	16	30	26	34	124	13	
308	1	1	4	-	-	6	1	
Inland	-	-	1	2	1	4	-	
US	1	2	1	1	4	9	1	
TOTAL	139	142	202	205	243	931		175
EDMONTON								
TOTAL			2	1	5	8		-
CANADA	265	298	356	377	418	1,714		158

*A - Percentage of Regional Total
*B - Percentage increase of 1980 over 1976.

SOURCE: SARSTATS

(c) The Halifax Region has the greatest distance for fixed wing aircraft to respond to marine incidents.

(d) Over the five year period 1976-80, 54% of all marine distress incidents occurred in the Victoria SRR.

(e) 44% of all distress incidents occurred in the waters surrounding Vancouver Island.

(f) 26% of all distress incidents occurred in the Straits of Georgia.

(g) 30% of all distresses occurred in the Trenton SRR.

(h) 12% of all incidents occured in Lakes Erie and Ontario.

(i) The most significant marine distress areas of the Halifax Region are in the PEI - north shore of NB and NS area, the Yarmouth - Georges Bank area and the NE shore of Newfoundland.

(j) Despite the rigorous climate of the Arctic and NWT, and the less developed air and marine navigation safety structure, relatively few distresses (6%) occur there.

(k) Over half the air distresses in the Edmonton region occur more than 400 nautical miles from its air base.

Characteristics of Air Incidents

3.16 Air incidents range from aircraft accidents to simple false alarms. Distress and non-distress situations both have a story to tell. Both kinds are examined in the following analysis of the reported statistics.

Air Distresses

3.17 Air distresses which relate to SAR are examined by a study of the 1976-1980 data from two sources: A1 and A2 SAR incidents from DND SARSTATS, and SAR related accidents from TC/AIDS records. SARSTATS lack any consistent report on the pilot involved and neither source reports on the survivability aspects of a distress. Definitions appear inconsistent also. The cause of the distress is not recorded in mutally exclusive categories, i.e. a reported catch-all category "crash" may have been caused by weather, flying into wires, crash after take-off or other event, but a distinction is not made. A large number of rotary wing aircraft involved in distresses are reported in SARSTATS as "privately" owned, although this is inconsistent with the fact that only 16% of all registered helicopters are privately owned. SARSTATS records are often incomplete with much data missing. Notwithstanding, the above records systems are the only data sources which can provide an indication of the nature of the air distresses.

Observations

3.18 Tables 3-10 and 3-11 A, B & C portray the causes of SAR distresses. The following conclusions may be drawn from the data for 1976-1980:

(a) Over the five years 737 air distresses were recorded. Within them, 323 aircraft accidents were reported upon. These distresses represent less than 8% of the total reported air SAR incidents.

(b) The most identifiable causes of air distresses that result in accidents are weather related. SARSTATS show 17% and TC/AIDS show 39%. Pilots either fly into weather conditions beyond their ability or the aircraft's capability to handle, with the resultant tragic outcome.

(c) Mechanical failure of an aircraft component is also a major identifiable cause of air distresses. This conclusion must be tempered by the large number of distresses in the "other" category.

(d) ELTs are carried by about half the aircraft that experience a distress. (This is true even after the imposition of the ELT waiver January 1, 1978.) ELTs were useful in locating downed aircraft in only 10% of the distresses.

(e) The majority of the aircraft which experience SAR distresses are privately owned or small commercial charter class. Of these 72% are single engined and 18% are helicopters. Of registered aircraft, helicopters comprise only 6%.

(f) In the Victoria and Trenton Regions single engined, commercially owned aircraft experience more than the national average for all aircraft distresses.

(g) Edmonton Region, which encompasses the majority of Canada's Arctic, has relatively few commercial aircraft distresses but has the greatest relative number of helicopter difficulties.

(h) About half of SAR related accidents are experienced by student or private licensed pilots. Commercial licensed pilots comprise another third, the majority of them likely to be flying the small commercial charter aircraft identified above.

(i) Government aircraft distresses represent 4% of the total. These incidents are usually the loss of fighter-type aircraft and rarely result in significant searches.

TABLE 3-10- AIR DISTRESS CHARACTERISTICS* 1976-1980

		VICTORIA	EDMONTON	TRENTON	HALIFAX	NATIONAL TOTAL (CASES WITH DATA)	PERCENT OF CATEGORY TOTAL
AIR	DISTRESS						
	A1	144	109	140	68	461	
	A2	122	47	93	10	272	
	TOTAL	266	156	233	78	733	99.5
PEOPLE	NUMBER OF PERSONS INVOLVED						
	A1	424	231	290	159		
	A2	278	112	212	32		
	TOTAL	702	343	502	191	1738	
	LIVES LOST						
	A1	189	80	90	53	412	
	A2	75	16	47	8	146	
	TOTAL	264	96	137	61	558	
	INCIDENTS WITH LOSS OF LIFE						
	A1	79	38	40	24	181	
	A2	31	8	21	3	63	
	TOTAL	110	46	61	27	244	
	LIVES SAVED						
	A1	235	151	200	106	692 -	
	A2	203	96	165	24	488	
	TOTAL	438	247	365	130	1180	
AIRCRAFT	AIRCRAFT OWNERSHIP	-	CASES	WITH DATA	-	668	
	COMMERCIAL	129	7	108	5	249	37.3
	PRIVATE	93	144	94	61	392	58.7
	GOVERNMENT	3	4	14	6	27	4.0
	AIRCRAFT TYPE ENGINES	-	CASES	WITH DATA	-	727	
	FIXED WING - ONE	200	104	169	51	524	72.1
	- 2 OR MORE	19	17	26	13	75	10.3
	ROTARY WING	43	35	35	15	128	17.6
DISTRESSES	CAUSE OF DISTRESS	-	CASES	WITH DATA	-	688	
	MECHANICAL	37	30	73	16	156	22.7
	LOW/OUT OF FUEL	14	21	16	5	56	8.1
	LOST	2	5	16	1	24	3.5
	WEATHER	40	22	45	12	119	17.3
	OTHER - CRASH, ETC.	157	61	73	42	333	48.4
	ELT						% OF CASE TOTAL
	AVAILABLE	127	96	130	34	387	52.8
	FACTOR IN LOCATION	26	16	29	5	76	10.4

(SOURCE: DND SARSTATS)

*TOTALS DO NOT ADD TO 737 INCIDENTS IN EVERY CATEGORY OWING TO MISSING DATA

TABLE 3-11A - LICENCE QUALIFICATION OF PILOTS INVOLVED IN SAR RELATED ACCIDENTS*

1976 - 1980

	PILOT LICENCE QUALIFICATION							NO DATA	TOTAL
	FIXED WING					ROTARY WING			
	STUDENT	PRIVATE	COMMERCIAL	ATR	GLIDER	PRIVATE	COMMERCIAL		
NUMBER OF PILOTS	6	146	97	33	2	1	35	3	323
PERCENT OF TOTAL	1.9	45.2	30.0	10.2	0.6	0.3	10.8	1.0	100

(SOURCE: TC/CANADA AIDS)

* TOTAL CASES WITH DATA 323

TABLE 3-11B - COMMERCIAL AIR SERVICE LICENCE OF AIRCRAFT INVOLVED IN SAR RELATED ACCIDENTS* 1976 - 1980

	ATC LICENCE CLASSIFICATION								TOTAL
	RECREATIONAL -PRIVATE -FLYING CLUB -OTHER	CLASS 4 CHARTER	BUSINESS -PRIVATE CO. -NON-REVENUE	TRAINING -SPECIALTY -FLYING CLUB -PRIVATE	SPECIALTY -SURVEY -SPRAYING -PHOTO ETC.	AIR CARRIER -TOLL -INT.CHARTER	STATE	OTHER	
NUMBER	134	85	41	24	15	4	7	13	323
PERCENT OF TOTAL	41.5	26.3	12.7	7.4	4.7	1.2	2.2	4.0	

(SOURCE: TC/CANADA-AIDS)

*TOTAL CASES WITH DATA - 323

TABLE 3-11C - SIGNIFICANT CONTRIBUTING FACTORS OF SAR RELATED ACCIDENTS* 1976 - 1980

A.	WEATHER RELATED	NUMBER OF CAUSE FACTORS	TOTAL	PERCENT OF TOTAL
	1. PILOT			
	CONTINUED VFR FLIGHT INTO ADVERSE WEATHER	92		
	INADEQUATE PRE-FLIGHT PREPARATION OR PLANNING	67		
	ATTEMPTED OPERATION BEYOND EXPERIENCE/ABILITY	64		
	IMPROPER IN-FLIGHT DECISION OR PLANNING	43		
	SPATIAL DISORIENTATION	39		
	FAILED TO SEE OR AVOID OBJECTS	21		
	EXERCISED POOR JUDGEMENT	16		
	FUEL EXHAUSTION	16	358	25.8
	2. ENVIRONMENT			
	LOW CEILING	66		
	FOG	35		
	RAIN	25		
	SNOW	24		
	WHITEOUT	19		
	TERRAIN	20	189	13.6
B.	JUDGEMENT/TECHNIQUE		138	9.9
C.	MECHANICAL (COMPONENT FAILURES)		184	13.3
D.	ALL OTHER (COLLISION WITH OBJECTS, LANDING ACCIDENTS, PHYSICALLY IMPAIRED FATIGUE, ETC.		519	37.4
	TOTAL		1388	100.00

* 323 ACCIDENTS WITH 1388 CONTRIBUTING CAUSE FACTORS

(SOURCE: TC/CANADA-AIDS)

Characteristics of Air Non-Distresses

3.19 The general nature of air non-distresses is displayed throughout the various charts and graphs. However, SARSTATS has considerable difficulty in recording the specific details of incidents. Consequently, a thorough analysis is difficult. The cause of the alert is well documented (Table 3-13 and Tables in Part III - Section 2) but when the alert becomes an incident, the cause of the incident is not. This stems in part from the fact that SARSTATS offers six categories of causes primarily applicable to distresses.

3.20 The statistical recording requirements for non-distresses should be restated with pertinent causes defined for these kinds of incidents. Table 3-12 illustrates both the paucity of data, the effect of inappropriate categories and the results of incomplete data recording. In five years of records, over 99% of the incidents have no information as to the cause factor.

3.21 Although not as large a user of SAR resources as air distresses are, non-distresses still warrant examination in order to reduce their occurrence. False alarms constitute a large portion of the recorded air non-distress incidents however, caused by both flight plan overdue alerts and ELT alerts. This data is displayed in Table 3-13 and in Part III Section 2 - Alerting. Determination of the reasons for the false alarms would help define both RCC workloads and appropriate response forces.

Observations

3.22 Air non-distresses reveal some of the following characteristics:

(a) Their occurrence has stabilized in recent years averaging approximately 2,000 incidents annually. False alarms represent 89%, (approximately 46% ELT and 44% overdues) of A3 incidents.

(b) In the Halifax Region, non-distresses dominate the occurrence of air incidents. This is due to the very large number of A-4s (84%), incidents which are potential SAR problems but require only monitoring. These are chiefly caused by over-flying trans-Atlantic air carriers who report on engine shut-down or a major system problem. These problems cause a precautionary alert to the RCC but rarely result in further action.

(c) The distribution of air non-distress incidents parallels that of air distresses for month, day of the week and time of day.

(d) No data is available to support conclusions with respect to persons assisted, aircraft ownership or type, or cause of incident except in the case of ELT false alarms. These latter incidents are reviewed later in this report.

TABLE 3-12 - CAUSES OF AIR NON-DISTRESSES (A3,A4,A5) 1976-80

CAUSE	VICTORIA					EDMONTON					TRENTON					HALIFAX					NATIONAL				
	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80
NO INFORMATION	531	465	426	511	611	587	525	392	378	447	469	479	395	424	433	622	553	493	472	457	2209	2022	1706	1785	1948
MECHANICIAL	-	-	-	-	1	-	-	-	2	-	1	-	-	-	3	-	-	-	1	2	1	-	-	3	6
WEATHER	-	-	-	-	-	-	-	1	2	-	-	-	-	2	3	-	-	-	-	1	-	-	1	4	4
OUT OF FUEL	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
LOST	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	1	1
OTHER	-	-	-	-	1	-	-	-	-	8	2	-	1	-	15	-	-	-	-	8	2	-	1	-	32
TOTAL	531	465	426	511	613	587	525	393	383	456	472	479	396	427	455	622	553	493	473	468	2212	2022	1708	1794	1992

SOURCE: DND SARSTATS

TABLE 3-13 ELT FALSE ALARM RATE COMPARED TO AIR NON-DISTRESSES

NATIONAL DATA 1976-80

(FIVE YEAR TOTAL A3 - 8,320 INCIDENTS)

INCIDENTS	1976	1977	1978	1979	1980	PERCENT OF A3 TOTAL
AIR NON-DISTRESS						
A3	1934	1731	1444	1497	1714	100
A4	274	286	260	293	275	
A5	4	5	4	3	3	
TOTAL	2212	2022	1708	1794	1992	
ELTS						
ALERTS	1132	1004	564	614	589	
FLASE ALARMS	1107	985	553	591	575	
% ELT FALSE ALARMS OF A3's	57.2	56.9	38.3	39.5	33.5	45.8
% ELT FALSE ALARMS OF ELT ALERTS	97.8	98.1	98.0	96.3	97.6	
OVERDUES (NON-DISTRESS	681	627	710	680	926	
% OVERDUES OF A3's	35.2	36.2	49.2	45.4	54.0	43.6

(SOURCE: SARSTATS)

(e) For statistical reporting and analysis, air non-distresses require new categories of cause factors distinct from those used for distresses.

The Characteristics of Marine Incidents

3.23 It has been shown that marine incidents are the driving force of SAR activity and services and for its response demand. Consequently, analysis of their nature and characteristics is important in defining the SAR problem. Because of the small number of marine incidents occurring in the Edmonton SRR, this region is not discussed in the following text.

3.24 For all data, it should be noted that the percentage increases use 1976 figures as the base year.

3.25 Arguments may be made as to the validity of the data recorded in SARSTATS and, therefore, the analysis may be questioned. The data originators may not always have been consistent in their interpretation of information. Nevertheless, the data has been available for the period 1976-1980, summarized both quarterly and annually and certainly the totals have been utilized to support the request for SAR resources in the annual SAR plans.

Marine Distress Cases

3.26 As discussed earlier, marine distress is of two types: that handled by dedicated SAR resources (M1) and that handled by other resources (M2).

3.27 Table 3-9 shows the number of distress cases by sub-area within region and the total for Canada, covering the five year period 1976-1980. From the table, it can be seen that Halifax SRR had a relatively stable number of incidents with only a 13% increase in the period, compared with the Canadian average of 58%. Trenton SRR was just below average with 51% while in Victoria SRR the increase was 75%.

3.28 Table 3-14 displays the SAR sub-areas in descending order of distress incidents as well as their percentage of the total and the cumulative percentage. As can be seen, the Victoria Region has the first 49% of all incidents occurring in six of its sub-areas and also has 54% of all incidents. Sub-areas 303 and 304 have more cases than any other sub-areas in the country.

3.29 Within the regions, the sub-areas with the largest percentage increase in the five year period are shown in Table 3-15.

TABLE 3-14
MARINE - DISTRESS INCIDENTS
AVERAGE OF 5 YEARS (1976-80)

	Sub-Area	Total Distress	Ave. Annual # of Distress	Percentage of Total	Cumulative Percentage
VICTORIA	303	332	66.4	19	
VICTORIA	304	125	25.0	7	26
VICTORIA	307	124	24.8	7	33
VICTORIA	305	104	20.8	6	39
VICTORIA	301	92	18.4	5	44
VICTORIA	306	91	18.2	5	49
TRENTON	108	65	13.0	4	53
TRENTON	105	52	10.4	3	56
TRENTON	104	51	10.2	3	59
TRENTON	107	51	10.2	3	62
TRENTON	109	48	9.6	3	65
TRENTON	141	47	9.4	3	68
VICTORIA	302	44	8.8	3	71
TRENTON	140	40	8.0	2	73
HALIFAX	004	39	7.8	2	75
TRENTON	103	39	7.8	2	77
HALIFAX	011	35	7.0	2	79
HALIFAX	007	34	6.8	2	81
TRENTON	106	32	6.4	2	83
HALIFAX	032	27	5.4	2	85
HALIFAX	008	25	5.0	2	87
TRENTON	110	21	4.2	1	88
TRENTON	100	21	4.2	1	89
HALIFAX	034	17	3.4	1	90
HALIFAX	033	17	3.4	1	91
HALIFAX	031	16	3.2	1	92
HALIFAX	005	14	2.8	4	96
TRENTON	102	10	2.0		
TRENTON	101	9	1.8		
HALIFAX	001	8	1.6		
HALIFAX	006	7	1.4		
HALIFAX	002	7	1.4		
HALIFAX	009	7	1.4		
VICTORIA	308	6	1.2		
INLAND including EDMONTON and US		57	-	4	100
		1,714	342.8	100	

TABLE 3-15

Sub-areas with largest percentage increase

Victoria	301 120%	306 142%
Trenton	109 120%	

(The large increases in the reported values for sub-areas 140 and 141 are accounted for by the placement of Inshore Rescue Boats during recent summer months.)

Halifax	004 500%

Downward trends are evident in sub-areas 033, 011 in Halifax SRR and in 107 in Trenton SRR where level of incidents decreased by 67%, 40% and 38% respectively.

Detailed analysis of Types 1 and Marine 2 Distress Cases (1976-1980)

3.30 Table 3-16 displays the type of vessel involved in distress situations. The proportion by vessel types varied from region to region with Victoria having 56% pleasure craft and 36% fishing vessel incidents; Trenton with 84% pleasure and 4% fishing vessel and Halifax 20% pleasure and 43% fishing. Halifax SRR had 43% of all commercial vessel distress incidents. The largest single increase by vessel type was in Victoria SRR with an 88% increase in the number of distress incidents to fishing vessels.

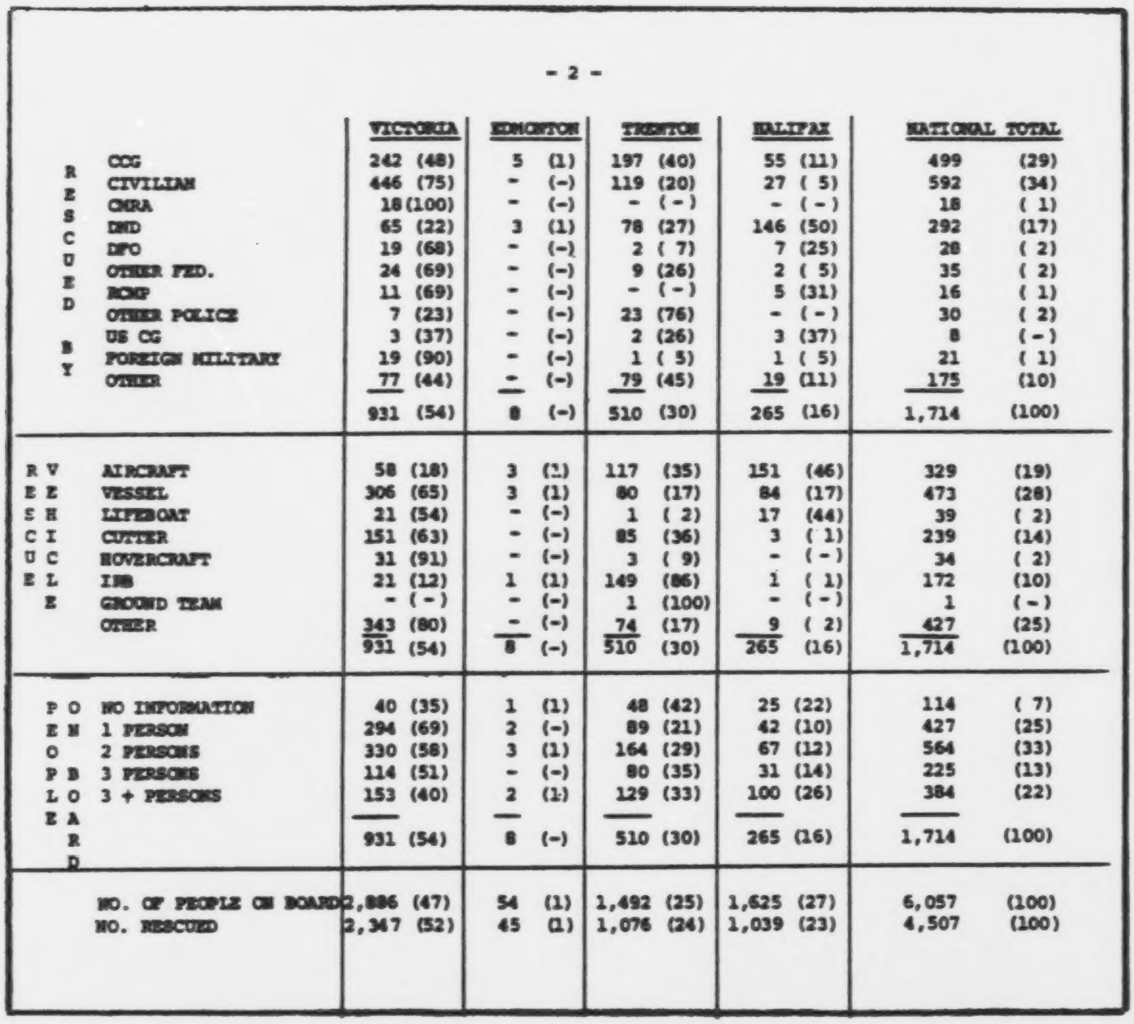
3.31 Of the vessels creating incidents, 33% had marine outboard and inboard-outboard power. Nationally, inboard-outboard incidents had a 130% increase over the period with most of this increase occurring in the Victoria SRR.

3.32 In the types of emergency notified to the RCC, "capsizing" 24% and "taking on water" 19% were the principal factors. Over the period, these types of emergencies accounted for approximately 53% of the incidents in the Victoria SRR with "fire" accounting for another 19%. In Trenton and Halifax SRRs, however, "breakdowns" were a relatively common form of emergency. The major increase under this heading was in Victoria SRR which had a 415% increase in vessels "taking on water".

3.33 Table 3-16 shows the reason for the emergency. The largest identified factor nationally is weather which accounts for 12% of the incidents. In the Victoria SRR, the major cause was grounding while in the Halifax SRR it was engine failure. These observations should be interpreted with caution since in all regions a very large percentage of the cases have

TABLE 3-16 DISTRESS CASES 1976-80

		VICTORIA	EDMONTON	TRENTON	HALIFAX	NATIONAL TOTAL
	DISTRESS					
	M1	619 (54)	7 (-)	320 (28)	208 (18)	1,154 (67)
	M2	312 (56)	1 (-)	190 (34)	57 (10)	560 (33)
		931 (54)	8 (-)	510 (30)	265 (16)	1,714 (100)
V	COMMERCIAL	19 (29)	1 (2)	17 (26)	28 (43)	65 (4)
E T	FISHING	332 (72)	1 (-)	18 (4)	113 (24)	464 (27)
S Y	PLEASURE	520 (52)	3 (-)	428 (43)	54 (5)	1,005 (59)
S P	TUG	21 (95)	- (-)	- (-)	1 (5)	22 (1)
E E	BARGE	- (-)	- (-)	1 (100)	- (-)	1 (-)
L	OTHER	39 (25)	3 (2)	46 (29)	69 (44)	157 (9)
		931 (54)	8 (-)	510 (30)	265 (16)	1,714 (100)
	MARINE INBOARD	357 (73)	- (-)	127 (26)	7 (1)	491 (29)
V	OUTBOARD	150 (52)	2 (1)	128 (45)	7 (2)	287 (17)
E P	INBOARD/OUTBOARD	193 (81)	- (-)	45 (19)	- (-)	238 (14)
S O	SAIL	53 (37)	1 (1)	89 (61)	1 (1)	144 (8)
S W	SAIL INBOARD	19 (45)	- (-)	23 (55)	- (-)	42 (2)
E E	OUTBOARD	60 (72)	- (-)	23 (27)	1 (1)	84 (5)
L R	PADDLE/POLE/OAR	42 (50)	2 (3)	39 (46)	1 (1)	84 (5)
	OTHER	57 (17)	3 (1)	36 (10)	248 (72)	344 (20)
		931 (54)	8 (-)	510 (30)	265 (16)	1,714 (100)
E	BREAKDOWN	29 (19)	1 (1)	78 (52)	43 (28)	151 (9)
T M	GROUNDING	44 (44)	- (-)	49 (49)	7 (7)	100 (6)
Y E	TAKING ON WATER	228 (70)	- (-)	48 (15)	49 (15)	325 (19)
P R	CAPSIZING	263 (63)	3 (1)	129 (31)	20 (5)	415 (24)
E G	FOUNDERING	60 (55)	- (-)	41 (37)	8 (7)	110 (6)
E	AFIRE	176 (76)	- (-)	32 (13)	25 (11)	233 (13)
O N	LOST	2 (7)	- (-)	18 (67)	7 (26)	27 (2)
F C	MAN O/BOARD	73 (61)	- (-)	38 (32)	8 (7)	119 (7)
Y	OTHER	56 (24)	3 (1)	77 (33)	98 (42)	234 (14)
		931 (54)	8 (-)	510 (30)	265 (16)	1,714 (100)
C	MECHANICAL FAILURE	1 (33)	- (-)	- (-)	2 (67)	3 (-)
A	WEATHER	16 (8)	4 (2)	159 (78)	25 (12)	204 (12)
U	OUT OF FUEL	4 (12)	- (-)	28 (82)	2 (6)	34 (2)
S	ENGINE FAILURE	10 (12)	2 (1)	45 (53)	29 (34)	85 (5)
E	GEAR FAILURE	- (-)	- (-)	12 (80)	3 (20)	15 (1)
D	COLLISION	22 (52)	- (-)	12 (29)	8 (19)	42 (2)
	GROUNDING	56 (67)	- (-)	23 (27)	5 (6)	84 (5)
B	FOUL PROP.	4 (44)	- (-)	5 (56)	- (-)	9 (1)
Y	LOST	2 (15)	- (-)	7 (54)	4 (31)	13 (1)
	OTHER	816 (67)	3 (-)	219 (18)	187 (15)	1,225 (71)
		931 (54)	8 (-)	510 (30)	264 (16)	1,714 (100)



		VICTORIA	EDMONTON	TRENTON	HALIFAX	NATIONAL TOTAL
RESCUED BY	CCG	242 (48)	5 (1)	197 (40)	55 (11)	499 (29)
	CIVILIAN	446 (75)	- (-)	119 (20)	27 (5)	592 (34)
	CMRA	18 (100)	- (-)	- (-)	- (-)	18 (1)
	DND	65 (22)	3 (1)	78 (27)	146 (50)	292 (17)
	DFO	19 (68)	- (-)	2 (7)	7 (25)	28 (2)
	OTHER FED.	24 (69)	- (-)	9 (26)	2 (5)	35 (2)
	RCMP	11 (69)	- (-)	- (-)	5 (31)	16 (1)
	OTHER POLICE	7 (23)	- (-)	23 (76)	- (-)	30 (2)
	US CG	3 (37)	- (-)	2 (26)	3 (37)	8 (-)
	FOREIGN MILITARY	19 (90)	- (-)	1 (5)	1 (5)	21 (1)
	OTHER	77 (44)	- (-)	79 (45)	19 (11)	175 (10)
		931 (54)	8 (-)	510 (30)	265 (16)	1,714 (100)
RESCUE VEHICLE	AIRCRAFT	58 (18)	3 (1)	117 (35)	151 (46)	329 (19)
	VESSEL	306 (65)	3 (1)	80 (17)	84 (17)	473 (28)
	LIFEBOAT	21 (54)	- (-)	1 (2)	17 (44)	39 (2)
	CUTTER	151 (63)	- (-)	85 (36)	3 (1)	239 (14)
	HOVERCRAFT	31 (91)	- (-)	3 (9)	- (-)	34 (2)
	IRB	21 (12)	1 (1)	149 (86)	1 (1)	172 (10)
	GROUND TEAM	- (-)	- (-)	1 (100)	- (-)	1 (-)
	OTHER	343 (80)	- (-)	74 (17)	9 (2)	427 (25)
		931 (54)	8 (-)	510 (30)	265 (16)	1,714 (100)
PEOPLE ON BOARD	NO INFORMATION	40 (35)	1 (1)	48 (42)	25 (22)	114 (7)
	1 PERSON	294 (69)	2 (-)	89 (21)	42 (10)	427 (25)
	2 PERSONS	330 (58)	3 (1)	164 (29)	67 (12)	564 (33)
	3 PERSONS	114 (51)	- (-)	80 (35)	31 (14)	225 (13)
	3 + PERSONS	153 (40)	2 (1)	129 (33)	100 (26)	384 (22)
		931 (54)	8 (-)	510 (30)	265 (16)	1,714 (100)
	NO. OF PEOPLE ON BOARD	2,886 (47)	54 (1)	1,492 (25)	1,625 (27)	6,057 (100)
	NO. RESCUED	2,347 (52)	45 (1)	1,076 (24)	1,039 (23)	4,507 (100)

been entered in the catchall category "others" which includes cases for which no information was reported. Nationally, "others" contained 71% of the 1,714 distress cases.

3.34 Of organizations which responded to an incident, "civilian" that is, vessels of opportunity, had 34% of the cases, CCG responded to 29%; DND, 17% and DFO, 2%. Trenton region showed a jump of 170% in CCG response, Victoria SRR had a 96% jump in "civilian", while in Trenton SRR it was CCG and in Halifax DND.

3.35 The type of vehicle which arrived first at the site of an incident is shown in Table 3-16. For those incidents in which the type of vessel was specified, 28% were non-dedicated resources, 28% dedicated SAR vessels and 19% aircraft. This data confirms the importance of DND aircraft in the Halifax SRR. The Victoria region had the largest increase by vehicle type with 246% the "vessel" category.

3.36 Vessels with 2 persons on board were involved in 33% of the incidents and with one person on board in 25% of the cases. Halifax SRR had 38% with three or more people on board while in the Trenton SRR this occurred in 25% of the cases.

Marine Non-Distress Cases

3.37 The major category of SAR incidents is that of marine non-distresses. It is necessary to explore the reasons for the growth in these kinds of SAR occurrences to understand the recent increased demand for SAR services. It should be noted that in the following discussion, percentage increases use 1976 figures as the base year. Table 3-17 shows the Marine Non-Distress cases by category and region.

3.38 Category 3 Marine incidents are non-distress cases and have three classifications:

(a) 3A - all marine incidents where aid of a technical or mechanical nature, including towing when necessary, was rendered.

(b) 3B - all other marine incidents of a minor nature including investigations of objects in the water, unspecified sightings, etc.

(c) 3C - communications search - an attempt to gain information on suspected marine distress incidents which eventually leads to the establishment of successful communications.

3.39 Additionally, there are Category 4 temporary distress cases which cause some level of alert at the RCC but are terminated without further emergency and require only monitoring. Category 5 are reactivated cases. Since these categories utilize very little of SAR resources, the subsequent analysis will deal with only the M3 incidents.

3.40 Table 3-17 displays the breakdown of these incidents.

TABLE 3-17
Marine Non-Distress Cases

CATEGORY TYPE	VICTORIA	EDMONTON	TRENTON	HALIFAX	NATIONAL TOTAL
3A	9,287 (59)	50 (1)	2,651 (17)	3,723 (24)	15,711 (62)
3B	5,300 (69)	134 (2)	1,465 (19)	801 (10)	7,700 (31)
3C	783 (45)	17 (1)	495 (29)	432 (25)	1,727 (7)
TOTAL 3	15,370 (61)	201 (1)	4,611 (18)	4,956 (20)	25,138 (99)
4	17 (5)	4 (1)	185 (53)	143 (41)	349 (1)
5	2 (25)	-	4 (50)	2 (25)	8 (-)
TOTAL NON-DISTRESS	15,389 (60)	205 (1)	4,800 (19)	5,101 (20)	25,495

Source: DND SARSTATS revised.

3.41 As can be seen from Table 3-19, a major increase in workload has occurred in the Category 3 non-distress cases where the annual number of incidents has risen by 80% from 3,443 in 1976 to 6,313 in 1980.

3.42 The regional and national percentage increases in the M3 category over the period 1976-1980 are:

Victoria	64%
Trenton	234%
Halifax	46%
National Total	84%

3.43 Table 3-20 displays the SAR sub-areas in descending order of non-distress incidents as well as their percentage of the total and the cumulative percentages. When compared with the similar table (3-14) for distress cases, sub-areas 007 and 004 jump dramatically in the sequence. In the case of 007 (S.E. shore of Nova Scotia) this is accounted for by the year round fishery both in-shore and off-shore. In the case of 004, (NB, PEI - Gulf of St. Lawrence) the provision of a lifeboat at Shippegan has brought increased reporting of incidents.

3.44 Within the regions, the following Table 3-18 shows those sub-areas with the largest percentage increase over the five year period 1976-1980.

TABLE 3-18

Sub-Areas with largest percentage increase

VICTORIA	304 158%		306 103%		
TRENTON	103 146%	104 300%	105 141%	109 273%	110 174%

TABLE 3-19 - 1976-80 CATEGORY 3 NON-DISTRESS INCIDENTS

BY SUB-AREA

REGION	1976	1977	1978	1979	1980	TOTAL	*A %	*B %
HALIFAX								
001	1	3	13	20	26	63	1	⊖
002	5	6	11	16	25	63	1	500
004	136	163	193	236	257	985	20	189
005	34	36	73	66	74	283	6	218
006	21	22	92	107	113	355	7	538
007	367	380	363	290	285	1,685	34	-
008	66	50	81	141	179	517	10	271
009	3	5	7	8	6	29	1	200
010	-	1	1	-	-	2	-	-
011	42	28	24	22	26	142	3	-
031	10	5	17	22	26	80	2	260
032	28	27	54	44	49	202	4	175
033	26	37	36	31	24	154	3	-
034	39	46	64	81	67	297	6	172
Inland	3	14	6	4	3	30	1	133
US	20	27	-	14	8	69	1	-
TOTAL	801	850	1,035	1,102	1,168	4,956	20	146
TRENTON								
100	20	35	20	33	25	133	3	125
101	1	4	6	5	18	34	1	⊖
102	9	12	7	30	21	79	2	233
103	39	75	85	95	135	429	9	346
104	18	19	27	47	72	183	4	400
105	93	134	154	176	225	782	17	242
106	27	43	38	43	35	186	4	130
107	38	32	47	83	101	301	7	266
108	88	80	127	157	166	618	13	189
109	45	89	191	166	171	662	14	380
110	38	10	26	65	104	243	5	274
140	3	69	60	179	280	591	13	+405
141	3	23	26	92	112	256	5	+487
Inland	15	43	7	1	6	72	2	-
US	8	8	7	5	14	42	1	175
TOTAL	445	676	828	1,177	1,485	4,611	18	334
VICTORIA								
301	210	296	363	382	311	1,562	10	148
302	139	167	167	251	219	943	6	158
303	993	1,212	1,344	1,582	1,480	6,611	43	149
304	275	359	495	715	709	2,553	17	258
305	148	166	248	269	272	1,103	7	184
306	90	99	122	162	183	656	4	203
307	277	253	310	353	354	1,547	10	128
308	12	6	6	6	9	39	-	-
Inland	12	91	1	18	7	129	1	-
US	28	38	86	42	33	227	2	-
TOTAL	2,184	2,687	3,142	3,780	3,577	15,370	61	164
EDMONTON								
TOTAL	13	20	38	47	83	201	1	-
CANADA	3,443	4,233	5,043	6,106	6,313	25,138	-	183

(+ percentage increase is based on 1977)

*A - Percentage of Regional Total
*B - Percentage increase of 1980 over 1976.
⊖ - Percentage increase too large to be meaningful.

SOURCE: SARSTATS

TABLE 3-20

MARINE - TYPE 3 NON-DISTRESS INCIDENTS

AVERAGE OF 5 YEARS (1976-80)

	Sub-Area	Total Non-Distress	Ave. Annual # of Non-Distress	Percentage of Total	Cumulative Percentage
VICTORIA	303	6,611	1,322.2	26	
VICTORIA	304	2,553	510.6	10	36
HALIFAX	007	1,685	337.0	7	43
VICTORIA	301	1,562	312.4	6	49
VICTORIA	307	1,547	309.4	6	55
VICTORIA	305	1,103	220.6	4	59
HALIFAX	004	985	197.0	4	63
VICTORIA	302	943	188.6	4	67
TRENTON	105	782	156.4	3	70
TRENTON	109	662	132.4	3	73
VICTORIA	306	656	131.2	3	76
TRENTON	108	618	123.6	3	79
TRENTON	140	591	118.2	2	81
HALIFAX	008	517	103.4	2	83
TRENTON	103	429	85.8	2	85
HALIFAX	006	355	71.0	1	86
TRENTON	107	301	62.0	1	87
HALIFAX	034	297	59.4	1	88
HALIFAX	005	283	58.6	1	89
TRENTON	141	256	51.2	1	90
TRENTON	110	243	48.6	1	91
HALIFAX	032	202	40.4	1	92
TRENTON	106	186	37.2	1	93
TRENTON	104	183	36.6	1	94
HALIFAX	033	154	30.8	3	97
HALIFAX	·011	142	28.4		
TRENTON	100	133	26.6		
HALIFAX	031	80	16.0		
TRENTON	102	79	15.8		
HALIFAX	002	63	12.6		
HALIFAX	001	53	10.6		
VICTORIA	308	39	7.8		
TRENTON	101	34	6.8		
HALIFAX	009	29	5.8		
HALIFAX	010	2	0.4		
INLAND including EDMONTON and US		770	-	3	100
		25,138	4,878.4	100	

TABLE 3-21 - CATEGORY 3 NON-DISTRESS CASES

1976 - 1980

		VICTORIA	EDMONTON	TRENTON	HALIFAX	NATIONAL TOTAL
VESSEL TYPE	NO INFO	1,542 (83)	35 (2)	263 (14)	27 (1)	1,867 (7)
	COMMERCIAL	83 (33)	7 (3)	83 (33)	29 (31)	252 (1)
	FISHING	2,971 (45)	6 (-)	29 (-)	3,634 (55)	6,640 (27)
	PLEASURE	10,041 (67)	143 (1)	3,917 (26)	804 (6)	14,905 (59)
	TUG	207 (87)	- (-)	20 (8)	12 (5)	239 (1)
	BARGE	4 (100)	- (-)	- (-)	- (-)	4 (-)
	OTHER	522 (42)	10 (1)	299 (24)	400 (33)	1,231 (5)
		15,370 (61)	201 (1)	4,611 (18)	4,956 (20)	25,138 (100)
VESSEL POWER	INBOARD	3,839 (75)	33 (1)	1,026 (20)	190 (4)	5,088 (20)
	OUTBOARD	2,430 (65)	31 (1)	1,242 (33)	50 (1)	3,753 (15)
	INBOARD/OUTBOARD	5,256 (89)	13 (-)	643 (11)	8 (-)	5,920 (24)
	SAIL	279 (33)	59 (7)	472 (57)	26 (3)	836 (3)
	SAIL-INBOARD	812 (74)	- (-)	271 (26)	12 (-)	1,095 (5)
	SAIL-OUTBOARD	567 (72)	1 (-)	204 (26)	12 (2)	784 (3)
	OAR-ETC.	183 (56)	17 (5)	122 (37)	6 (2)	328 (1)
	OTHER	2,004 (27)	47 (1)	631 (9)	4,652 (63)	7,334 (29)
		15,370 (61)	201 (1)	4,611 (18)	4,956 (20)	25,138 (100)
TYPE OF EMERGENCY	BREAKDOWN	7,340 (59)	21 (-)	1,858 (15)	3,262 (26)	12,481 (50)
	GROUNDING	1,195 (62)	7 (-)	658 (34)	81 (4)	1,941 (8)
	TAKING ON WATER	314 (70)	4 (-)	65 (15)	62 (14)	445 (2)
	CAPSIZE	50 (15)	11 (3)	241 (74)	22 (7)	324 (1)
	FOUNDERING	2 (9)	1 (4)	20 (87)	- (-)	23 (-)
	AFIRE	24 (43)	- (-)	27 (48)	5 (9)	56 (-)
	LOST	76 (39)	- (-)	75 (38)	44 (23)	195 (1)
	MAN O/BOARD	1 (17)	- (-)	4 (66)	1 (17)	6 (-)
	OTHER	6,368 (66)	157 (2)	1,663 (17)	1,479 (15)	9,667 (38)
		15,370 (61)	201 (1)	4,611 (18)	4,956 (20)	25,138 (100)
CAUSED BY	MECHANICAL	12 (75)	- (-)	- (-)	4 (25)	16 (-)
	WEATHER	32 (6)	11 (2)	441 (86)	23 (4)	507 (2)
	OUT OF FUEL	584 (62)	7 (1)	275 (29)	72 (8)	938 (4)
	ENGINE FAILURE	1,364 (26)	7 (-)	1,255 (24)	2,677 (50)	5,303 (21)
	GEAR FAILURE	49 (15)	5 (2)	158 (52)	94 (31)	306 (1)
	COLLISION	14 (47)	1 (3)	13 (43)	2 (7)	30 (-)
	GROUNDING	1,161 (85)	8 (1)	120 (9)	67 (5)	1,356 (5)
	FOULED PROP.	201 (31)	1 (-)	70 (11)	380 (58)	652 (3)
	LOST	11 (13)	- (-)	38 (44)	37 (43)	86 (-)
	OTHER	11,942 (75)	161 (1)	2,241 (14)	1,600 (10)	15,944 (64)
		15,370 (61)	201 (1)	4,611 (18)	4,956 (20)	25,138 (100)

		VICTORIA	EDMONTON	TRENTON	HALIFAX	NATIONAL TOTAL
ASSISTED BY	NO INFO	1,493 (58)	28 (2)	493 (19)	536 (21)	2,550 (10)
	CCG	7,625 (53)	129 (1)	3,019 (21)	3,663 (25)	14,436 (58)
	CIVILIAN	4,162 (86)	40 (1)	613 (13)	18 (-)	4,833 (19)
	CMRA	23 (66)	- (-)	10 (29)	2 (5)	35 (-)
	DND	635 (64)	2 (-)	93 (10)	258 (26)	988 (4)
	E.C.	421 (53)	2 (-)	25 (3)	352 (44)	800 (3)
	F&O	18 (38)	- (-)	- (-)	30 (62)	48 (-)
	OTHER FEDERAL	265 (72)	- (-)	30 (8)	73 (20)	368 (2)
	FOREIGN MIL	72 (98)	- (-)	1 (1)	1 (1)	74 (-)
	MUNICIPAL	12 (92)	- (-)	1 (-)	- (-)	13 (-)
	OPP	- (-)	- (-)	1 (100)	- (-)	1 (-)
	OTHER POL.	361 (64)	- (-)	188 (34)	10 (2)	559 (2)
	PRIVATE	71 (83)	- (-)	11 (13)	3 (4)	85 (-)
	PROV. AGENCIFS	54 (31)	- (-)	148 (67)	3 (2)	175 (1)
	P.W.C.	9 (90)	- (-)	1 (10)	- (-)	10 (-)
	RCMP	146 (96)	- (-)	- (-)	6 (4)	152 (1)
	USCG	3 (27)	- (-)	7 (64)	1 (9)	11 (-)
		15,370 (61)	201 (1)	4,611 (18)	4,956 (20)	25,138 (100)
RESCUE VEHICLE	NO INFO	1,493 (58)	28 (1)	502 (20)	537 (21)	2,560 (10)
	AIRCRAFT	414 (50)	3 (-)	163 (20)	247 (30)	827 (3)
	VESSEL	2,238 (64)	8 (-)	306 (7)	1,024 (29)	3,576 (14)
	LIFEBOAT	932 (26)	39 (1)	12 (-)	2,675 (73)	3,658 (15)
	CUTTER	3,895 (75)	1 (-)	1,209 (23)	79 (2)	5,184 (21)
	HOVERCRAFT	1,311 (98)	- (-)	5 (-)	20 (-)	1,336 (5)
	INSHORE BOAT	1,297 (34)	110 (3)	2,041 (54)	328 (9)	3,776 (15)
	GROUND PARTY	3 (100)	- (-)	- (-)	- (-)	3 (-)
	OTHER	3,787 (90)	12 (-)	373 (9)	46 (1)	4,218 (17)
		15,370 (61)	201 (1)	4,611 (18)	4,956 (20)	25,138 (100)
ASSISTANCE PROVIDED	CREW	- (-)	- (-)	20 (87)	3 (13)	23 (-)
	FOOD	- (-)	- (-)	- (-)	1 (100)	1 (-)
	FUEL	246 (88)	- (-)	30 (11)	2 (-)	278 (1)
	MECHANICAL	145 (77)	2 (1)	37 (20)	4 (2)	188 (1)
	MEDICAL	- (-)	- (-)	1 (-)	15 (94)	16 (-)
	TOW	160 (56)	- (-)	24 (8)	102 (36)	286 (1)
	OTHER	1,477 (45)	56 (2)	1,774 (53)	5 (-)	3,312 (13)
	NO INDICATION	13,342 (63)	143 (1)	2,725 (13)	4,824 (23)	21,034 (84)
		15,370 (61)	201 (1)	4,611 (18)	4,956 (20)	25,138 (100)
DAY OF WEEK	MONDAY	2,702 (64)	27 (1)	734 (17)	774 (18)	4,237 (17)
	TUESDAY	1,863 (60)	19 (1)	485 (16)	719 (23)	3,086 (12)
	WEDNESDAY	1,685 (58)	14 (1)	445 (15)	740 (26)	2,884 (12)
	THURSDAY	1,728 (59)	18 (1)	486 (16)	722 (24)	2,954 (12)
	FRIDAY	1,735 (58)	22 (1)	515 (17)	720 (24)	2,992 (12)
	SATURDAY	2,523 (61)	49 (1)	831 (20)	733 (18)	4,136 (16)
	SUNDAY	3,134 (65)	52 (1)	1,115 (23)	548 (11)	4,849 (19)
		15,370 (61)	201 (1)	4,611 (18)	4,956 (20)	25,138 (100)

As in the case of distress incidents, the reported values for sub-areas 140 and 141 are accounted for by the placement of inshore rescue boats during the summer months.

	4	5	6	8	032	002
Halifax	89%	118%	438%	171%	75%	400%

3.45 These increases can be attributed to the following factors:

(a) greater reliance on the SAR program for the provision of technical or mechanical services;

(b) availability of a higher level of SAR coverage;

(c) an annual increase in the number of vessels at risk.

3.46 As in the case of the distress incidents, most non-distress incidents occur in the Victoria SRR and specifically in sub-areas 301-304 where 46% of all marine non-distress incidents (Category 3) in Canada occur and 26% of the national total in sub-area 303 alone (Table 3-20).

Detailed Analysis of Type 3 Non-Distress (1976-1980)

3.47 Table 3-21 displays the type of vessel involved in a non-distress situation. The largest single percentage increase by vessel type occurred in the Trenton SRR where there was a 270% increase in the number of incidents to pleasure craft in the five year period. Halifax SRR recorded a 103% increase in pleasure craft incidents. Victoria SRR maintained an overall 10% annual increase. The proportions of vessel types varied from region to region, as can be seen from the table, with Halifax having 73% fishing vessel incidents against 16% pleasure craft, Trenton 1% fishing and 85% pleasure, Victoria 19% fishing to 65% pleasure. These differences in vessel type are reflected in the data on incidents by motive power. Whereas in both the Victoria and Trenton SRR, vessels with either outboard or inboard-outboard motors were involved in between 40-50% of the incidents, in Halifax SRR less than one percent were so powered. Over the period, inboard-outboard had a 139% increase but the largest single percentage increase was in sail which rose to 203% of its 1976 size.

3.48 "Breakdown" was the largest single cause of incidents reported to the RCC and had a 194% increase over the period. The column headed "other" with 38%, consists of incidents where either no indication was given or an "other" type of emergency occurred. In all regions, "breakdown" and "grounding" were the leading reported types of incidents, in striking contrast to distress cases where "capsizing" and "taking on water" predominate.

3.49 The causes of non-distress incidents are also listed in Table 3-21 where the largest percentage recorded against a specific category is attributed to "engine failure". Here again, the "other" column contains most of the cases, indicating either a lack of precision in recording the causes of incidents or a failure to acquire the needed data. Other common causes are grounding, out-of-fuel, gear failure and fouled propellers. Unlike the situation for distress cases, weather is not a significant factor except in the Trenton SRR. "Weather" has had the largest percentage increase over the period (560%) while the second highest was the "out-of-fuel" category (165%).

3.50 In response to incidents, the CCG provided the finding resource in 58% of the cases, DND assisted in 4% and the Department of Fisheries and Oceans (EC-plus F & O in Table 3-21) in 3%. The second most important source of assistance was the civilian group which provided help in 19% of the cases. The CCG was the major responding resource in all regions and was involved in 74% of the cases in the Halifax SRR, 66% in the Trenton SRR and 50% in the Victoria SRR. Civilian participation ranged from a high of 27% in the Victoria SRR to about half this in the Trenton SRR and less than one percent in the Halifax SRR.

3.51 Here again, the growth trend was most significant in the Trenton SRR. The incidents handled by the CCG increased by 425% between 1976 and 1980, a result of positioning new lifeboats and IRBs in this region. Major increases were also evident in both the Victoria and Halifax regions where instances of assistance provided by DFO increased by 201% and 848% respectively. It is reasonable to assume that this is a direct result of the introduction of the multi-tasking concept with a resultant increase in the number of incidents reported. There is as yet insufficient evidence to judge the utility of the other major initiative of this period, the formation of the Canadian Marine Rescue Auxiliary in 1979.

3.52 The major resource used was the CCG cutters (60 ft+) which assisted nationally in 21% of the incidents. Inshore boats, lifeboats and vessels were also in common usage. For the Victoria SRR, the major resources were cutters, vessels and "others" while in Trenton SRR, IRBs and cutters provided 70% of the responses. In the Halifax SRR, however, the lifeboat was used in 54% and vessels in 21%. Over the period, the largest percentage increases were for vessels and IRBs. Vessel utilization increased by 388% while for IRBs the growth was 199%. Included in the former are vessels of opportunity as well as those of DFO and non-dedicated SAR resources.

3.53 Unfortunately, data on the type of assistance offered are of low grade and in 84% of the cases there is no information of any assistance provided. It is not possible to distinguish among situations in which no information was available, no assistance was required, no assistance was provided or simply that no information was recorded. Additionally, in 13% of the incidents the type of assistance has been recorded in the "other" category. Hence although technical or mechanical aid was provided in 15,7 Category 3A incidents, the specific type of assistance provided is availab for only 792 cases (5%). However, towing emerged as the action taken in 6 of 1,212 incidents examined in detail during a recent study of cases in th Victoria SRR sub-areas 304-307, during the period July 1979 to June 1980. The "emergency" self-corrected in 12% of cases and it was necessary to remove the person(s) on board in only 5% of the cases. In 44% of these incidents, the action agent was a primary SAR resource, with secondary SAR resources involved in 11% and other vessels in 32%.

3.54 Nationally, a little more than half the incidents occurred over the week-end with Sunday accounting for 20%. This basic pattern was commo to the Victoria and Trenton SRRs but in the Halifax SRR, incidents occurre with a fairly even frequency from Mondays to Saturdays and tapered off on Sunday.

3.55 As can be seen from Table 3-22, nationally, non-distress incidents (M3) are much more localized than distress cases. Approximately 50% of non-distress cases are reported by four sub-areas, 80% by 12 and 90 by the top 20, whereas for distress, the top five account for approximatel 50%, the top 17 for 80% and the first 24 for 90%. On a sub-area basis, th distribution of non-distress is also different from that of distresses. A a result, the ratio of distresses to non-distresses varies substantially among the sub-areas. Within the Trenton SRR, sub-areas 104 and 101 have approximately 21 distress per 100 incidents while in the Halifax SRR, sub-areas 011 and 009 have approximately 19 distress per 100 incidents. A the other extreme, sub-areas such as 303 and 304 in the Victoria SRR which are the major sites of SAR incidents, have a ratio of distresses to total incidents that is less than five per hundred. By this measure, the top twenty sub-areas are ten from the Trenton SRR, seven from the Halifax SRR and only three from the Victoria SRR. The major Victoria sub-areas are 30 306, and 305 with values of 13, 12 and 9 respectively.

Observations

3.56 Analysis of the SARSTAT data suggests a number of observations o marine SAR incidents. These are:

General

(a) Information entered in the SARSTATS system has improved over the last five years.

(b) For some categories of information, the "other" and/or "no information" sub-categories are too large to be useful measures o program performance.

TABLE 3-22 MARINE SAR 1976-80

SUB-AREA	NON-DISTRESS	RANK	DISTRESS	RANK	TOTAL	DISTRESS PER 100 INCIDENTS	RANK
VICTORIA 303	6,611	1	332	1	6,943	4.8	27
VICTORIA 304	2,553	2	125	2	2,678	4.7	29
HALIFAX 007	1,685	3	34	18	1,719	2.0	33
VICTORIA 301	1,562	4	92	5	1,654	5.6	25
VICTORIA 307	1,547	5	124	3	1,671	7.4	21
VICTORIA 305	1,103	6	104	4	1,207	8.6	18
HALIFAX 004	985	7	39	15	1,024	3.8	32
VICTORIA 302	943	8	44	13	987	4.4	31
TRENTON 105	782	9	52	8	834	6.2	24
TRENTON 109	662	10	48	11	710	6.8	22
VICTORIA 306	656	11	91	6	747	12.2	12
TRENTON 108	618	12	65	7	683	9.5	17
TRENTON 140	591	13	40	14	631	6.3	23
HALIFAX 008	517	14	25	21	542	4.6	30
TRENTON 103	424	15	39	16	468	8.3	19
HALIFAX 006	355	16	7	31	362	1.9	34
TRENTON 107	301	17	51	10	352	14.5	8
HALIFAX 034	297	18	17	24	314	5.4	26
HALIFAX 005	283	19	14	27	297	4.7	28
TRENTON 141	256	20	47	12	303	15.5	6
TRENTON 110	243	21	21	22	264	8.0	20
HALIFAX 032	202	22	27	20	229	11.8	13
TRENTON 106	186	23	32	19	218	14.7	7
TRENTON 104	183	24	51	9	234	21.8	1
HALIFAX 033	154	25	17	25	171	9.9	16
HALIFAX 011	142	26	35	17	177	19.8	3
TRENTON 100	133	27	21	23	154	13.6	9
HALIFAX 031	80	28	16	26	96	16.7	5
TRENTON 102	79	29	10	28	89	11.2	14
HALIFAX 002	63	30	7	32	70	10.0	15
HALIFAX 001	53	31	8	30	61	13.1	11
VICTORIA 308	39	32	6	34	45	13.3	10
TRENTON 101	34	33	9	29	43	20.9	2
HALIFAX 009	29	34	7	33	36	19.4	4
OTHERS	772		57		829	6.9	
HALIFAX	4,956	20%	265	15.5%		5.35	
TRENTON	4,611	18%	510	29.8%		11.06	
VICTORIA	15,370	61%	931	54.3%		6.06	
EDMONTON	201	1%	8	0.5%		3.98	
CANADA	25,138	100%	1,714	100%		6.82	

Distress Cases

(c) Aside from what may be ascribed to random fluctuations, the Halifax SRR, with the exception of sub-area 004, has maintained essentially the same level of activity throughout the period 1976-1980.

(d) Similarly, the Trenton SRR, with the exception of sub-area 109 which had a 220% increase and sub-areas 140 and 141, has had only a slight increase in the level of activity during the period.

(e) Victoria SRR has had an overall increase of 75% during the period with growth in almost every sub-area.

(f) Nationally, pleasure craft (59% of distress) were the prime source of distress calls, with Victoria SRR handling 52% of this category.

(g) Fishing vessel (27% of distress) incidents are the second most frequent and have occurred mainly in Victoria SRR with 72%, even though Halifax SRR has four times the population of fishing vessels.

(h) By type of emergency, capsizing (24%), taking on water (19%), and fire (13%) were the main reasons for a distress.

(i) In the sub-category of fire, Victoria SRR had 76% of the total which was considerably above the 54% proportion of regional distress cases to national cases. Similarly, taking on water and capsizing had 70% and 63% respectively of their sub-category.

(j) In Trenton SRR, lost (67%) and breakdown (52%) were above the average ratio of regional cases to national cases.

(k) In the finding or "rescued by" category, civilian or vessels of opportunity had the highest national percentage (34%) followed by CCG (29%).

(l) In Victoria SRR, 48% of incidents were handled by vessels of opportunity and 27% by CCG.

(m) In Trenton SRR, 39% of distress incidents were handled by CCG and 23% by vessels of opportunity.

(n) In Halifax SRR, 55% of distress incidents were handled by DND and 21% by CCG.

(o) The number of people on board or rescued varies from year to year depending on the size of the vessel in distress.

Non-Distress Cases

(p) Halifax SRR, with the exception of sub-areas 007, 010, 011 and 033, showed increased activity during the period, most notably area 006 which had a 438% increase.

(q) Trenton SRR showed a dramatic increase (234%) in activity to almost three times the national average. This was accounted for by the placing of additional vessels and IRB.

(r) Victoria SRR had three sub-areas 304 (158%), 305 (84%), and 306 (103%) with above average increases.

(s) Pleasure craft with 59% of all cases were the prime source of non-distress incidents, with Victoria SRR handling 67% and Trenton SRR 26%. Over the period 1976-1980, in the Trenton SRR the increase was 270% while in Victoria the increase was 63%.

(t) In Victoria SRR, 20% of all non-distress cases were fishing vessels even though they represent only three percent of the population.

(u) Fishing vessels accounted for 27% of non-distress cases with 55% of them occurring in the Halifax SRR and 45% in Victoria SRR (cf - distress cases above).

(v) Vessels with inboard/outboard (I/O) motors created 24% of non-distress incidents followed by inboard motors with 20%. In Victoria SRR, 34% of incidents were I/O whereas in Trenton SRR, 27% were outboard engines.

(w) The major type of emergency in all regions was breakdown (50%) caused by engine failure (21%).

(x) Victoria SRR had a high incidence of grounding.

(y) CCG handled 58% of all non-distress incidents (cf distress cases above) with civilian handling 19%. In Victoria SRR, 50% were handled by CCG compared with 65% in the Trenton and 74% percent in the Halifax SRRs.

(z) Overall, Halifax SRR maintained a steady growth in activity with an average annual growth rate of 10%.

(aa) Overall, Trenton SRR has had a 35% average annual increase in activity, in part accounted for by the placement of IRBs and lifeboats.

(ab) Overall, Victoria SRR has had a 14% average annual increase in activity. In the period 1979-1980, however, there was a decline of 5% in the level of activity.

(ac) Canada overall had a 26% average annual growth rate but with only a 3% growth in 1980 over 1979.

SECTION 4 - THE SAR PROGRAM IN OPERATION

General

4.1 The federal Program may be measured statistically to show the workload, the activities and the expenditures made to deliver the Program.

Workload

4.2 A portion of Table 3-1 and all of Table 3-2 are displayed below to indicate the relative levels of work faced by the SAR system as measured by reported SAR incidents. Observations with respect to these incidents are presented in paragraph 4.7.

TABLE 3-1 - ABBREVIATED NATIONAL OCCURRENCE OF INCIDENTS

INCIDENT TYPE		CALENDAR YEAR					TOTAL	PERCENT OF TOTAL
		1976	1977	1978	1979	1980	1976-80	
DISTRESS	- AIR	138	148	169	151	131	737	1.8
	- MARINE	265	298	356	377	418	1714	4.1
OTHER	- AIR	2212	2022	1708	1794	1992	9728	23.4
	- MARINE	3528	4279	5119	6189	6383	25498	61.4
HUMANITARIAN & CIVIL		807	938	660	740	697	3842	9.3
TOTAL		6950	7685	8012	9251	9621	41519	

(SOURCE: DND SARSTATS)

TABLE 3-2 - DISTRIBUTION OF INCIDENTS BY REGION

INCIDENTS	NATIONAL TOTALS 1976-1980	REGIONAL PERCENTAGE OF NATIONAL TOTAL				PERCENT OF NATIONAL TOTAL
		VICTORIA	EDMONTON	TRENTON	HALIFAX	
AIR						
DISTRESS	737	36.4	21.2	31.6	10.9	1.8
OTHER	9728	26.2	24.1	22.9	26.8	23.4
TOTAL	10465	26.9	23.9	23.5	25.7	25.2
MARINE						
DISTRESS	1714	54.3	0.5	29.8	15.5	4.1
OTHER	25498	60.4	0.8	18.8	20.0	61.4
TOTAL	27212	60.0	0.8	19.5	19.7	65.5
HUMANITARIAN & CIVIL	3842	57.0	1.1	9.9	32.0	9.3
TOTALS	41519	51.4	6.6	19.6	22.4	100.0
ALL DISTRESSES	2451	49.0	6.7	30.3	14.0	5.9

(SOURCE: DND SARSTATS)

4.3 If trends of the last five years continue, the workload for 1985 would approximate:

TABLE 4-1 1985 PROJECTION

	PERCENT CHANGE/ YEAR	1985 TOTALS
AIR INCIDENTS:		
DISTRESS	0	147
OTHER	0	1,946
TOTAL		2,093
MARINE INCIDENTS:		
DISTRESS	12.1	741
OTHER	16.0	13,406
TOTAL		14,147
HUMANITARIAN & CIVIL	1.1	740
—- TOTAL INCIDENTS	15.3	16,980

Program Responses

4.4 For the above workload, the SAR system responded to all of the five-year total of 41,519 incidents in some manner. The resources expended are shown below in the following tables and figures.

Operations

4.5 One measure of the expenditure of resources is the hours sailed by marine craft or flown by aircraft. These include all categories of craft; SAR dedicated federal resources, secondary vessels and aircraft and craft of opportunity of every kind of ownership. The nature and kind of this resource expenditure is shown as follows:

TABLE 4-2 FLYING HOURS EXPENDED FOR SAR OPERATIONS (1966 - 1980)

	DISTRESSES				OTHER INCIDENTS		TOTALS	
	AIR		MARINE		INCIDENTS	HOURS	INCIDENTS	HOURS
	INCIDENTS	HOURS	INCIDENTS	HOURS				
1966	124	7422	275	955	1094	1601	1493	9978
1967	127	7381	314	703	1819	1491	2260	9575
1968	138	5473	368	1488	1979	1598	2485	8559
1969	133	6974	336	489	2002	1479	2471	8942
1970	131	7353	417	783	2561	2302	3109	10438
1971	190	6766	463	558	2810	1910	3463	9234
1972	199	7789	459	736	2985	1619	3643	10144
1973	212	7000	477	1200	3473	1250	4162	9450
1974	189	7883	522	1005	4146	2066	4857	10954
1975	174	5842	444	821	5731	3242	6349	9905
1976	138	5973	265	1410	6547	3233	6950	10616
1977	148	6483	298	1267	7239	4010	7685	11760
1978	169	7013	356	1941	7487	2955	8012	11999
1979	151	6310	377	1111	8723	2983	9251	10404
1980	131	3929	418	1215	9072	3102	9621	8246

SOURCE: DND SARSTATS

TABLE 4-3A AIR HOURS EXPENDED FOR SAR OPERATIONS (1975 - 1980)

	1975	1976	1977	1978	1979	1980
AIR						
DISTRESS	5842	5973	6483	7013	6310	3929
OTHER*	1467	1165	1347	804	737	909
TOTAL	7309	7138	7830	7907	7047	4838
MARINE						
DISTRESS	821	1410	1267	1941	1111	1215
OTHER	263	340	682	810	936	736
TOTAL	1084	1750	1949	2751	2047	1951
HUMANITARIAN						
DISTRESS	1371	1548	1783	1147	993	1056
OTHER	6	27	32	23	26	27
TOTAL	1377	1575	1815	1170	1069	1083
CIVIL						
DISTRESS	111	124	125	140	227	281
OTHER	24	29	41	31	64	93
TOTAL	235	153	166	171	291	374
TOTAL	9905	10616	11760	11999	10404	8246

SOURCE: DND SARSTATS

TABLE 4-3B - AIR HOURS EXPENDED* FOR NON-DISTRESS ELT'S

	1975	1976	1977	1978	1979	1980
ELT NO DISTRESS	831	763	707	353	255	338
ELT FALSE ALARMS (PART OF NO DISTRESS)	729	607	545	260	186	228

*(HOURS INCLUDED IN AIR (OTHER) ABOVE)

SOURCE: DND SARSTATS

TABLE 4-4A FLYING TIMES FOR SAR RESPONSE 1976-1980

	VICTORIA					EDMONTON					TRENTON					HALIFAX					FIVE YEAR TOTALS	
	1976	1977	1978	1979	1980	1976	1977	1978	1979	1980	1976	1977	1978	1979	1980	1976	1977	1978	1979	1980	HOURS	PERCENT
AIR																						
DEDICATED (DND)	1758	1112	2477	1320	692	1019	1812	1145	1344	756	894	984	735	652	906	1029	348	346	869	294	20519	38.7
SECONDARY (DND)	193	97	659	226	67	322	345	297	236	136	476	1930	318	344	295	124	85	110	140	137	6537	12.3
OTHER	855	442	739	656	397	317	550	980	1110	526	91	124	97	115	571	61	0	5	7	63	7706	14.6
TOTAL	2806	1651	3875	2202	1156	1658	2707	2422	2690	1418	1461	3038	1150	1111	1772	1214	433	461	1043	494	34762	65.6
MARINE																						
DEDICATED (DND)	260	637	672	439	608	0	0	18	24	20	178	62	252	371	203	537	623	927	629	675	7135	13.4
SECONDARY (DND)	102	107	319	114	99	0	0	0	2	0	25	16	49	41	33	392	323	211	160	158	`2151	4.1
OTHER	103	75	102	79	86	3	0	0	0	2	140	103	117	166	61	10	3	83	23	6	1162	2.2
TOTAL	465	819	1093	632	793	3	0	18	26	22	343	181	418	578	297	939	949	1221	812	839	10448	19.7
HUMANITARIAN																						
DEDICATED (DND)	459	540	289	219	230	58	18	25	2	3	21	26	17	28	70	368	494	675	667	692	4901	9.3
SECONDARY (DND)	391	454	32	16	15	6	0	4	0	0	1	5	7	10	18	78	52	52	47	26	1214	2.3
OTHER	163	215	49	21	24	0	0	7	7	0	27	11	13	3	4	4	0	0	0	1	549	1.0
TOTAL	1013	1209	370	256	269	64	18	36	9	3	49	42	37	41	92	450	546	727	714	719	6664	12.6
CIVIL																						
DEDICATED (DND)	44	54	32	63	66	45	0	14	11	0	4	24	30	37	12	32	61	44	139	195	907	1.7
SECONDARY (DND)	0	12	8	3	15	3	0	0	0	19	2	7	1	3	8	8	5	5	14	18	131	0.2
OTHER	2	2	2	12	16	9	0	0	0	0	2	2	35	9	24	2	0	0	0	0	117	0.2
TOTAL	46	68	42	78	97	57	0	14	11	19	8	33	66	49	44	42	66	49	153	213	1155	2.1
TOTAL	4330	3747	5380	3168	2315	1782	2725	2490	2736	1462	1861	3294	1671	1779	2205	2645	1994	2458	2721	2265	53028	100.0
	1976	1977	1978	1979	1980																	
NATIONAL	10618	11760	11999	10404	8247																	
5 YEAR TOTAL																					53028	

SOURCE: DND SARSTATS

TABLE 4-4B DISTRIBUTION OF FLYING TIMES FOR SAR RESPONSE 1976-1980

	PERCENT OF REGION TOTAL				PERCENT OF FIVE YEAR NATIONAL TOTAL				FIVE YEAR NATIONAL TOTAL	
	VICTORIA	EDMONTON	TRENTON	HALIFAX	VICTORIA	EDMONTON	TRENTON	HALIFAX	HOURS	PERCENT OF NATIONAL TOTAL
AIR										
DEDICATED (DND)	38.9	54.3	38.6	24.1	35.9	29.6	20.3	14.2	20,519	38.7
SECONDARY (DND)	6.5	11.9	31.1	5.0	19.0	20.5	51.4	9.1	6,537	12.3
OTHER	16.3	31.1	9.2	1.1	40.1	45.2	13.0	1.7	7,706	14.6
TOTAL	61.7	97.3	78.9	30.2	33.7	31.3	24.5	10.5	34,762	65.6
MARINE										
DEDICATED (DND)	13.8	0.6	9.9	28.1	36.7	0.9	14.9	47.5	7,135	13.4
SECONDARY (DND)	3.9	0.0	1.5	10.3	34.5	0.1	7.6	57.8	2,151	4.1
OTHER	2.3	0.1	5.4	1.0	38.3	0.4	50.5	10.8	1,162	2.2
TOTAL	20.0	0.7	16.8	39.4	36.4	0.7	17.4	45.5	10,448	19.7
HUMANITARIAN										
DEDICATED (DND)	9.2	0.9	1.5	24.0	35.4	2.2	3.3	59.1	4,901	9.3
SECONDARY (DND)	4.8	0.1	0.4	2.1	74.8	0.8	3.4	21.0	1,214	2.3
OTHER	2.5	0.1	0.5	0.0	86.0	2.5	10.6	0.9	549	1.0
TOTAL	16.5	1.1	2.4	26.1	46.8	2.0	3.9	47.3	6,664	12.6
CIVIL										
DEDICATED (DND)	1.4	0.6	1.0	3.9	28.6	7.7	11.8	51.9	907	1.7
SECONDARY (DND)	0.2	0.2	0.2	0.4	29.0	16.8	16.0	38.2	131	0.2
OTHER	0.2	0.1	0.7	0.0	29.1	7.7	61.5	1.7	117	0.2
TOTAL	1.8	0.9	1.9	4.3	28.7	8.7	17.3	45.3	1,155	2.1
REGIONAL TOTAL (FIVE YEAR)	18,940	11,195	10,810	12,083					53,028	

Source: DND SARSTATS

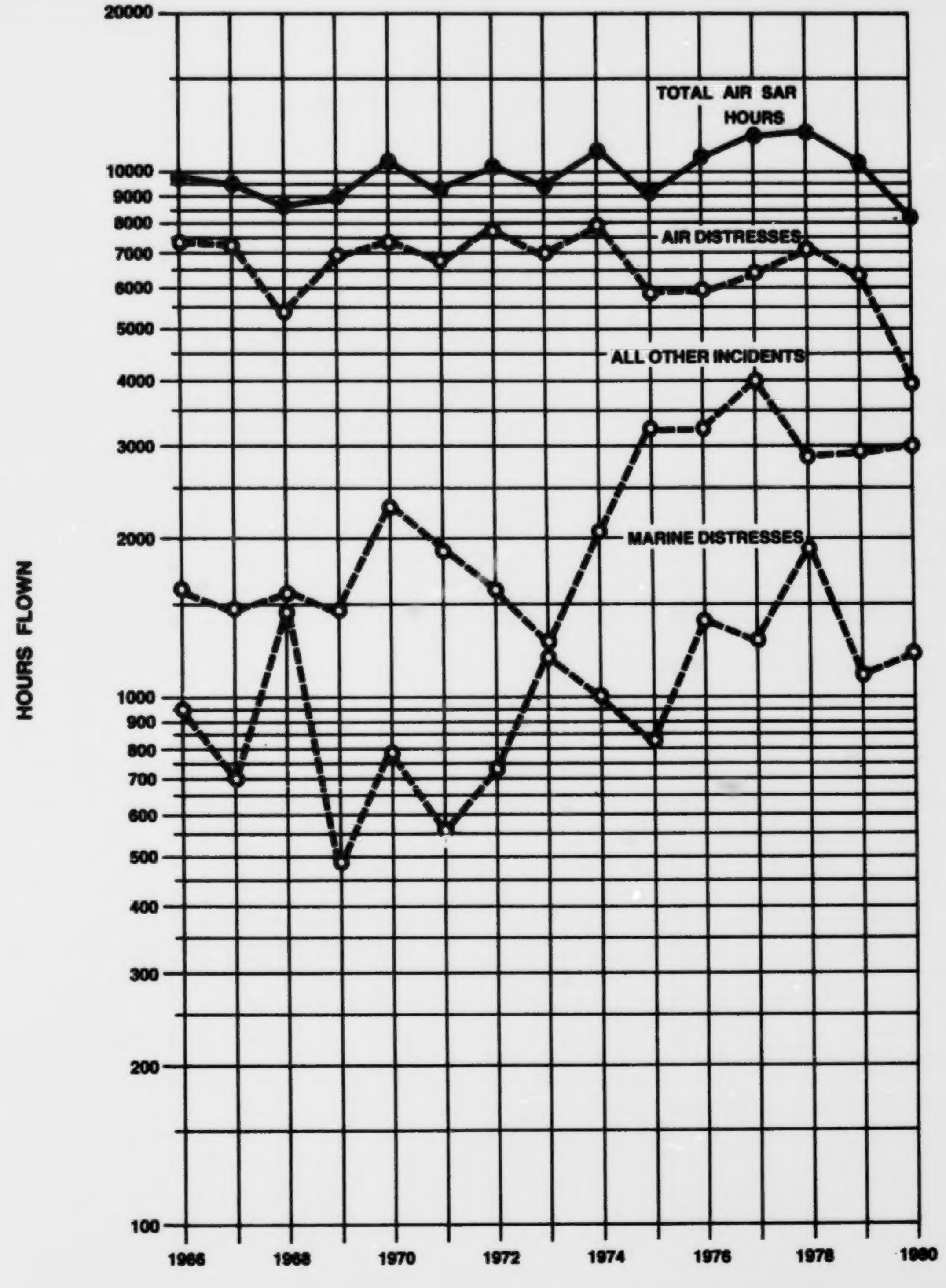


FIGURE 4-1 FLYING HOURS EXPENDED FOR SAR OPERATIONS (1966-1980) (ALL TYPES)

(SOURCE: DND SARSTATS)

TABLE 4-5 VESSEL HOURS EXPENDED FOR SAR OPERATIONS (1975 - 1980)

	1975	1976	1977	1978	1979	1980
AIR						
DISTRESS	75	276	119	368	206	237
OTHER	12	66	40	37	109	117
TOTAL	87	342	159	405	315	354
MARINE						
DISTRESS	2309	2489	2373	3782	3198	3460
OTHER	6464	7901	10264	1854	14905	15674
TOTAL	8773	10390	12637	15636	18103	19134
HUMANITARIAN						
DISTRESS	348	321	323	391	684	473
OTHER	1	1	18	16	16	15
TOTAL	349	322	341	407	706	488
CIVIL						
DISTRESS	16	74	123	143	111	173
OTHER	40	72	96	90	152	132
TOTAL	56	146	219	233	263	305
TOTAL	9265	11200	13356	16681	19381	20281

SOURCE: DND SARSTATS

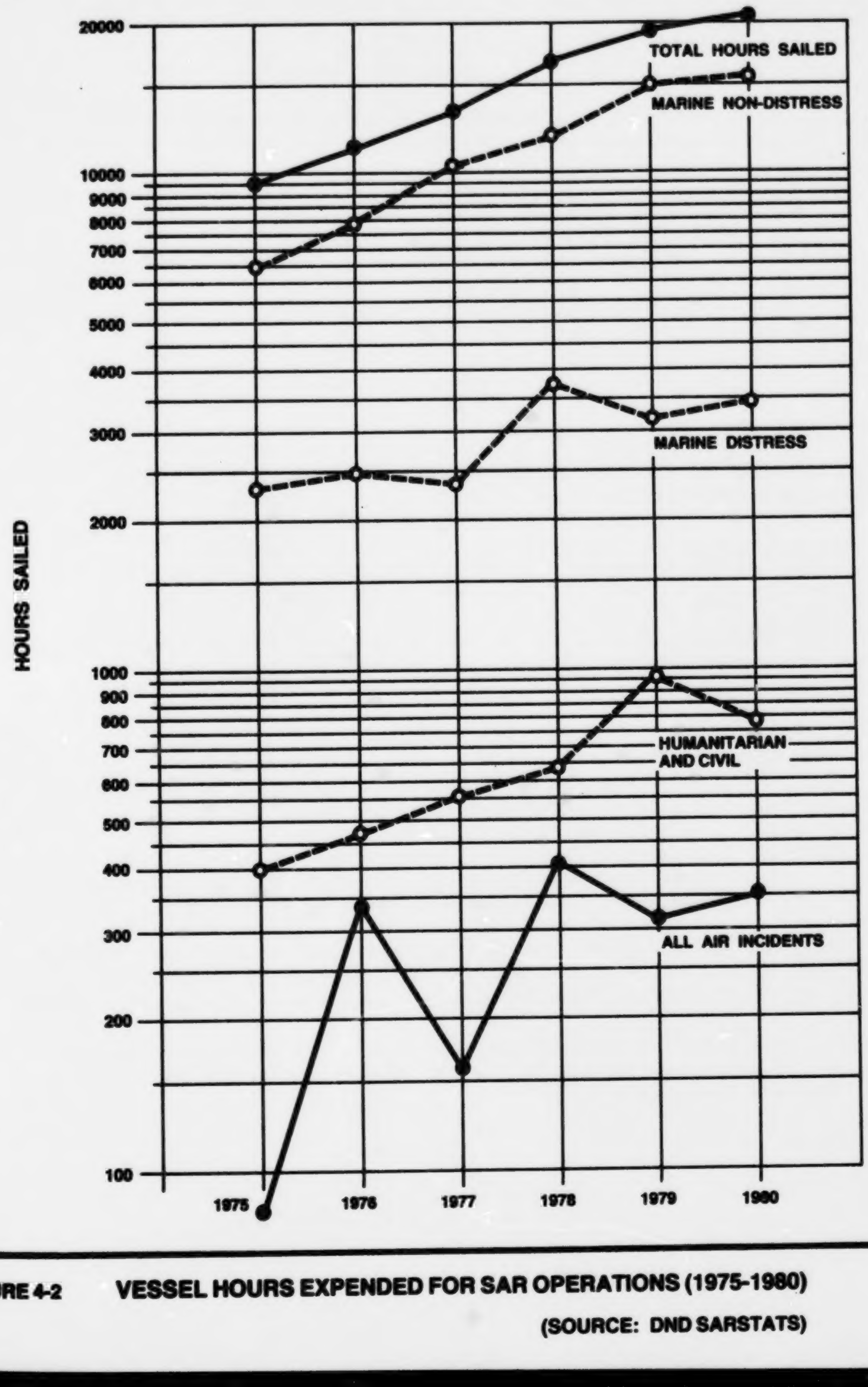


FIGURE 4-2 **VESSEL HOURS EXPENDED FOR SAR OPERATIONS (1975-1980)**

(SOURCE: DND SARSTATS)

SAR Program Costs

4.6 For the fiscal year 1981/82, the National SAR Plan Program estimates were:

TABLE 4.6

	DND	DOT	DFO	TOTAL
CAPITAL	$ 7.6*	$ 19.9	$ 0.3	$ 27.8
OPERATING & MAINTENANCE	59.1	29.1	3.1	91.3
TOTAL*	66.7	49.0	3.4	119.1
PERSON YEARS	801	701	102	1,613

* (Millions of Dollars)

Implementation of the SAR Program, therefore, represents an expenditure of approximately $91 million by the estimating methods used and requires over 1,600 person years. These figures will be evaluated in Part 5, and estimates increased as suggested by the evidence presented.

Observations

4.7 An examination of the data from 1966 to 1980 and from 1975 to 1980 produces a number of indications:

Air

(a) The major workload occurs in responding to air distresses. In the main, these are the 6,000 hours per year expended in searches for missing aircraft or about 57% of the total air hours;

(b) The fifteen-year trend in the employment of air hours for SAR or distresses has not changed significantly from approximately 9,000 to 11,000 hours except for a downward trend in the last two years;

(c) Air hours expended for marine distresses and all other incidents (air other, marine other, humanitarian and civil) show no significant increase or decrease trends over the last five years;

(d) ELT non-distress responses constitute 51% of hours flown, a significant portion of the air resources expended on non-distress air responses;

(e) Trenton and Victoria Regions utilize a similar percentage of their flying hours for marine response;

(f) Halifax, the second largest consumer of air hours, uses 66% or by far the majority of these hours to respond to marine and humanitarian events;

(g) The employment of aircraft for humanitarian purposes in Halifax in recent years outstrips the other regions both proportionately and absolutely;

(h) DND dedicated aircraft fly 63% of the hours flown for SAR. Another 19% come from DND secondary aircraft for a total of 82% of the hours. DND is in effect multi-tasking its non-dedicated aircraft fleet to augment SAR operations. Of the remaining 18%, the majority, approximately 15 of the 18%, are for air responses. These latter hours are flown mainly by civilian aircraft, usually volunteers assisting in searches for missing aircraft.

Marine

(i) Total hours sailed to respond to marine SAR incidents have increased at a steady 20% rate over the last six years. This increase is the result of responses to a 24% increase in marine non-distress incidents;

(j) Hours sailed to respond to marine distresses and air incidents have apparently stabilized over the three years, 1978 - 1980;

(k) Vessel hours responding to humanitarian and civil incidents have increased steadily over the six years driven mainly by response to humanitarian distress events.

SECTION 5 - PROGRAM RESULTS

General

5.1 The SAR Program exists for the purpose of saving lives at risk, primarily of those operating in the air and marine commercial and recreational transportation worlds. An RCC controller, therefore, determines a SAR response to this life threatening event based on policy, experience, training and the circumstances of each incident.

Human Results - Air

5.2 The following tables show the number of persons involved in air distress and indicative ratios over the five years from 1976 to 1980. These figures are only indicative of the nature of the problem because there is no differentiation between those casualties which the SAR system can and cannot help. About 60 to 70% of those involved in air crashes are killed on impact and the SAR operations system cannot help them. Other distresses without accident obviously have a much higher survival rate. No record is kept of persons still alive after a distress notification who are subsequently saved or not. Such a record would provide a superior measure of how the system was performing. Efforts to save lives are at least 92% effective if figures from DOT accident investigation reports are used to arrive at the number of persons killed on impact and the approximate number of those whose lives were still at risk when RCCs were notified. Additionally, the data are not always complete in all air distress reporting. An overview of available SARSTATS information is displayed below in Tables 5-1A, B, C.

Human Results - Marine

5.3 Marine distress data are drawn from annual SARSTATS summaries which display M1 (Dedicated SAR resource) incidents only. The five-year data is displayed in Table 5-2 and trends in Figure 5-1. A dramatic change took place in the number of persons involved between 1978 and 1979 caused by a threefold jump in the numbers reported from Victoria SRR. This is probably due to a revised method of recording incidents. It is of interest to note that the number of lives lost does not change significantly over the five-year period despite rapid increases in the number of persons involved, and roughly a doubling of the number of CCG SAR vessels from 1976-1980. An analysis reported by the DND/CCG Interdepartmental Review Team in "A Report on the Marine SAR Program in the Victoria SAR" indicates that the lives lost probably could not have been reduced regardless of the capability and availability of SAR forces. The ratio of survivors to persons involved is 98%. No precise information is available to enable adjustments in the ratio for lives still at risk when RCCs were notified.

TABLE 5-1A

HUMAN INVOLVEMENT IN AIR DISTRESSES (A1 & A2)

Distresses	Incidents With Loss of Life					No. of Persons Involved					Lives Lost					Survivors				
	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80
Victoria	19	16	30	26	19	116	147	148	160	131	41	55	67	64	37	75	92	81	96	94
Edmonton	6	11	9	12	8	73	75	67	81	47	10	22	13	30	21	63	53	54	51	26
Trenton	10	14	10	13	14	80	96	116	100	110	19	27	21	36	34	61	69	95	64	76
Halifax	5	5	5	7	5	47	37	50	18	39	7	17	17	9	11	40	20	33	9	28
National	40	46	54	58	46	316	355	381	359	327	77	121	118	139	103	239	234	263	220	224
5 Yr. Total	244					1,738					558					1,180				

TABLE 5-1B

RATIO OF LIVES LOST PER AIR DISTRESS (A1 & A2)

1976-1980

REGION	76	77	78	79	80
Victoria	2.2	3.4	2.2	2.5	1.9
Edmonton	1.7	2.0	1.4	2.5	2.6
Trenton	1.9	1.9	2.1	2.8	2.4
Halifax	1.4	3.4	3.4	1.3	2.2
National	1.9	2.6	2.2	2.4	2.2

Average All Distresses - 2.3

$$\text{Ratio} = \frac{\text{Lives Lost}}{\text{Incidents With Loss of Life}}$$

TABLE 5-1C

RATIO OF LIVES SAVED BY SAR DEDICATED RESOURCES (A1)

REGION	76	77	78	79	80
Victoria	0.52	0.59	0.43	0.53	0.74
Edmonton	0.85	0.65	0.76	0.56	0.31
Trenton	0.71	0.70	0.75	0.64	0.64
Halifax	0.86	0.53	0.64	0.47	0.79
National	0.69	0.61	0.61	0.56	0.66

$$\text{Ratio} = \frac{\text{Lives Saved}}{\text{Persons Involved}}$$

TABLE 5-2 - HUMAN INVOLVEMENT IN MARINE DISTRESSES (M1)

1976 - 1980

DISTRESSES REGION	INCIDENTS WHERE DATA WAS AVAILABLE					NUMBER OF PERSONS INVOLVED					LIVES LOST					SURVIVORS				
	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80
Victoria	75	95	107	118	148	185	202	266	823	841	8	7	6	7	5	177	195	260	816	836
Edmonton	0	0	1	1	1	0	0	42	0	1	0	0	0	0	1	0	0	42	0	0
Trenton	36	56	54	66	66	97	184	172	173	177	4	10	5	4	13	93	154	167	169	164
Halifax	32	26	36	35	34	158	208	222	193	203	27	3	10	1	11	131	205	212	192	192
National	143	177	198	220	249	440	574	702	1189	1222	39	20	21	12	30	401	554	681	1177	1192
5 Yr. Total	987					4,127					122					4,005				

SOURCE: DND SARSTATS

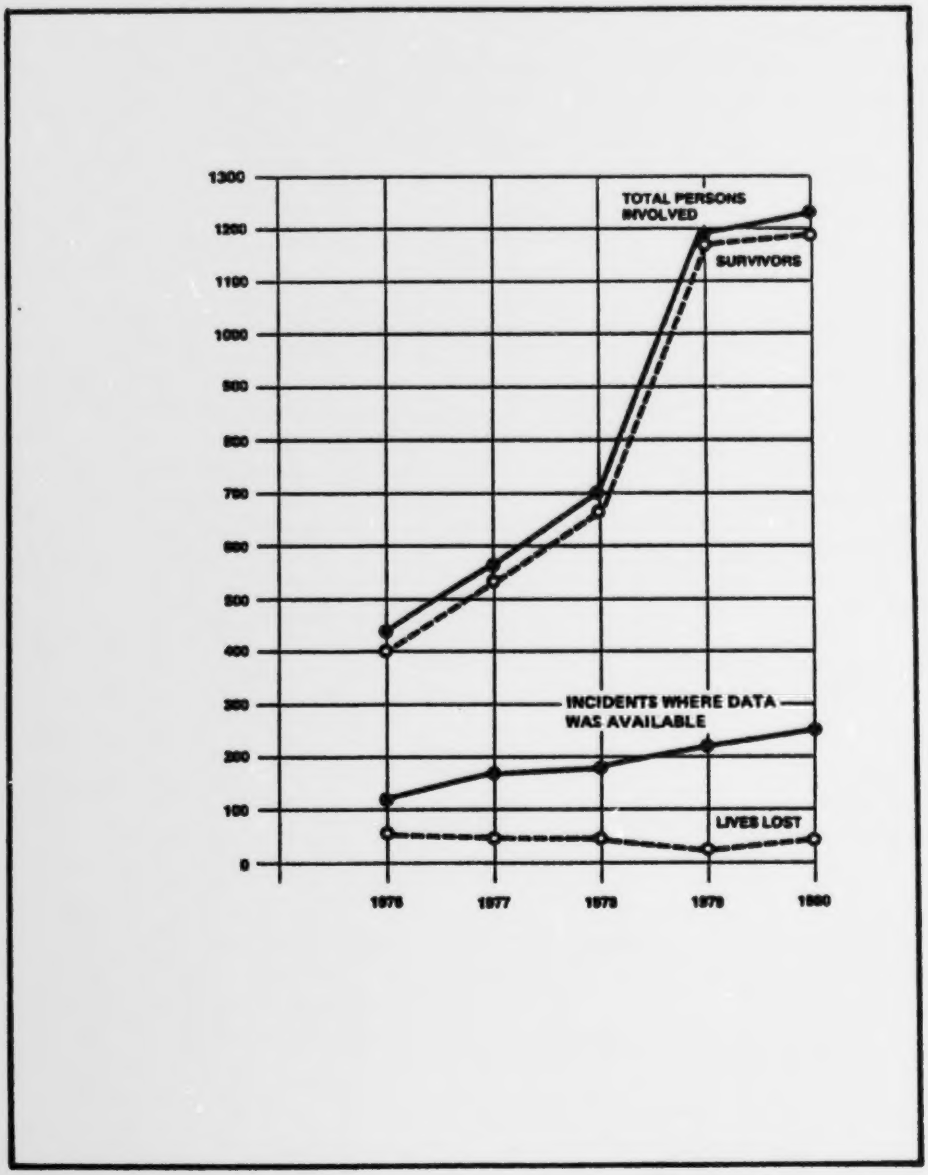


FIGURE 5-1 TRENDS IN HUMAN INVOLVEMENT — MARINE DISTRESSES (MI) 1976-1980

TABLE 5 - 3

HUMANITARIAN ASSISTANCE RENDERED - 1976-1980

(Provincial Government Cases Not Included)

No. of Cases	National				
	76	77	78	79	80
Resources Used					
Aircraft	440	506	354	309	324
Vessel	126	174	184	221	199
Assistance Rendered To Persons on Marine Craft					
Fishing Vessel	38	51	64	60	49
Pleasure Craft	14	10	32	29	9
Ship	35	42	48	82	51
Other	30	14	16	23	41
Number of Patients Transported (Air)	575	657	535	472	508
	5 Yr. Average = 550/Year				

TABLE 5 - 4

CIVIL AID CASES - 1976-1980

	National				
	76	77	78	79	80
Cases					
Total	34	50	39	40	46
Successful	15	19	21	21	22
Persons					
Involved	87	58	99	93	170
Located	76	41	92	80	57
Ground Search Party Used	6	6	5	3	4

SOURCE: DND SARSTATS

Results - Humanitarian and Civil

5.4 These two categories record assistance provided largely for medical evacuation (humanitarian) and searches for missing persons (civil aid). These services are generally provided by provincial air ambulance services or police forces. Where the RCC is contacted and other means are not available, a SAR dedicated resource is used. In addition, dedicated DND ground search parties may be used at the 18 remote bases in isolated areas where they are located. These teams are an RCC SAR resource.

5.5 Tables 5-3 and 5-4 indicate the number of cases and the persons affected by these two categories of activities.

Other Results

5.6 Despite the SAR Program's primary reason for existence as stated in paragraph 5.1, it provides a number of additional services. These, in fact, consume most of the SAR Program resources in the marine world, less so in the air world. As demonstrated in Section 3, the response to breakdowns, tows and other assistance to pleasure craft and fishing vessels figures strongly in the outputs of the program - a factor that is increasing significantly the number of incidents each year. There is, at present, neither a stated objective that Program resources should perform this task nor is there a measure of its output. If providing aid in a non-distress situation continues to be part of the Program, some record should be kept of persons who are not in distress but who are otherwise assisted and whose property is protected. Additionally, the entire non-distress world should be more thoroughly assessed since these incidents utilize a major part of SAR resources. Appropriate measures are needed to assess trends, performance and effort in terms of people and property.

Observations

5.7 Examination of the operation and results of the SAR Program raises the following points:

a. There are inadequate indicators of persons saved or assisted by the Program. The present system records only persons involved in distresses regardless of whether they could have been assisted by SAR operations or not.

b. In the calendar year, 1980, the following figures demonstrate the Program's results:

(1) Number of incidents	9,621
(2) Air hours expended	8,246
(3) Air hours expended for air or marine distress	5,144 (62% of air hours)
(4) Vessel hours expended	20,281
(5) Vessel hours expended for air or marine distress	3,697 (18% of vessel hours)

(6) Persons involved in air distresses	327
(7) Survivors of air distresses	224 (69%)
(8) Persons involved in marine distresses (M1)	1,222
(9) Persons survived (M1)	1,192 (98%)
(10) Persons or property otherwise assisted	totals not recorded
(11) Humanitarian assistance incidents (medical evacuation)	523
(12) Humanitarian incidents responded to by aircraft	324 (62%)
(13) Number of patients transported	508
(14) Number of persons involved in civil aid incidents	170
(15) Number of civil aid persons located	57 (34%)
(16) Estimated cost of program	$104 million* 1,600 person years

* ISAR team revised figures

c. These indicators measure the response that took place. There are no stated policy objectives for levels of service, standards or goals against which to measure these results in terms of achieving Program objectives.

SECTION 6 - CONCLUSIONS

6.1 The observations made throughout this part lead to the following conclusions by section reference:

Section 1

(a) The National SAR Plan is not a national plan, but a federal SAR plan which takes little account of existing or possible expansion of provincial, municipal or private sector participation. Thus the existing SAR response system does not make full use of facilities which could be adapted to specialized SAR needs. Consequently federal over-resourcing for SAR is a distinct possibility.

(b) Greater use of provincial resources and greater reliance on volunteer organizations and the commercial private sector are feasible options both for the conduct of SAR operations and in SAR prevention. A resourcing philosophy based on such an approach would be consistent with IMCO and ICAO agreements and, as the Team's analysis in other parts of this report shows, could lead to a more effective SAR program.

(c) There is a possibility for a wide range of trade-offs in making decisions about the mix of prevention and safety programs impinging on SAR as opposed to providing resources for SAR operations.

Section 2

(d) The total number and character of trips undertaken by operators of privately owned aircraft and pleasure craft is unknown, and their voyages are not monitored in many instances. Thus lengthy notification times are most likely to occur with this segment of the SAR clientele.

Section 3

(e) The data base suffers from gaps in some areas, nevertheless samples are sufficiently large to enable trends to be deduced.

(f) The occurrence of air incidents, both distress and non-distress has stabilized despite an increase in registered aircraft and licensed pilots. High fuel costs, less disposable income, improved training and greater emphasis on SAR prevention measures probably contribute to this result.

(g) Despite the preponderance of commercial air and military operations, by far the greatest proportions of SAR clientele come from private and small commercial aviation. In general, pilots and operators engaged in these latter activities have the least training, experience, equipment and aircraft capability to meet the challenge of Canadian extremes of weather, rugged terrain and the remoteness of much of the country.

(h) Existing SAR air bases are generally well located to respond to air incidents except for Edmonton, and to a lesser degree, Trenton. Edmonton is located at the western edge of its region although incidents are distributed fairly equally over the region with a slight weighting towards Manitoba and Northwestern Ontario. Trenton based aircraft are somewhat removed from the incidents in Central Québec. Air bases appear to be properly located for marine incidents except for the availability of fixed wing aircraft for offshore work in the Halifax Region. Thus improvements in response would require either more bases or faster aircraft or both.

(i) Air, humanitarian and civil incidents appear to be distributed relatively evenly throughout the week with a slight peak at the weekend. Air incidents tend to be created by private and small commercial aircraft and peak in July. Marine incidents are created mainly by pleasure craft with an average of two people on board, capsizing or taking on water on a Sunday in July between 1400 and 1800 hours. Thus there are substantial daily, weekly and annual variations in SAR incident levels. This provides an opportunity, particularly in the marine area, for a resourcing philosophy which uses volunteers, part-time employment, and part-time craft to cover peak periods.

(j) Fishing vessels have the highest percentage of incidents for their population, indicating that SAR prevention efforts need to be concentrated in this area.

(k) Primary federal SAR resources rescue or assist in the majority of incidents. Also the positioning or repositioning of federal SAR vehicles causes significant increases in the number of incidents of all types recorded or responded to. Thus, new federal vessels displace previously provided self-help, or vessels of opportunity. This being the case, particular care must be taken in deciding when the type and number of incidents justify displacement of multi-tasked vehicles, vehicles of other jurisdictions, or volunteers, or in areas of high vessel traffic where the probability of assistance from vessels of opportunity is high.

Section 4

(l) DND is the major contributor to air response. Air hours flown are mainly for air distresses. A further significant and growing proportion of air hours is flown for marine distresses. This suggests that integrated planning of the air and marine response to marine incidents is becoming vital.

(m) CCG vessel hours sailed are principally in response to marine non-distress incidents, the number of which has risen 20% annually in recent years. This reinforces the conclusion on the importance of a careful consideration of the displacement effect, and also suggests that marine force postures could be improved by providing a better match between SAR incident patterns, SAR vessel deployment and vessel types.

Section 5

(n) There are no policies on levels of service, standards or goals against which to measure performance. Thus only qualitative judgments on the performance of the SAR response system are possible.

PART III
SAR OPERATIONS

SECTION 1 - DESCRIPTION

Objectives

1.1 Within the specific groups of activities (Operations, Prevention, Management Process) which make up the SAR Program, Operations is directly pertinent to the saving of lives and the saving of property where it is a concomitant of saving lives. Operations has three major objectives:

a. Alerting: to know of actual or potential distress, who is involved and when and where it occurs;
b. Responding: to provide for timely arrival of assistance; and
c. Aiding: to provide the necessary aid.

1.2 Each of the above objectives requires specific standards, has associated activities with specific task objectives and all result in tasks which accomplish the major objectives. In saving lives in peril or facing potential peril the tasks are:

a. Alerting: detecting, notifying and locating
b. Responding: reacting, transitting and searching
c. Aiding: deploying rescue resources, assisting and evacuating.

1.3 There are standards for some, but not all of these tasks. Importantly missing are standards for tasks that require major equipment and resources for training personnel. Actual or proposed standards will be discussed later.

Resources

1.4 The nine tasks listed above are executed by four federal government organizations: Transport Canada's Canadian Air Transport Administration (CATA) and the Canadian Coast Guard (CCG) Division of the Canadian Marine Transport Administration; the Department of National Defence (DND), and the multi-tasked vessels of the Department of Fisheries and Oceans (DFO). SAR Operations are performed mainly by these federal agencies but have the assistance of a number of associated provincially-supported or other participants in the Program. Their resources are summarized in Table 1-1.

1.5 An examination of Table 1-1 reveals the flow of Objective Activity execution through Alerting, Responding and Aiding. For Alerting, systems whose primary responsibility is the normal safe conduct of air and marine navigation, have the supplementary responsibility to detect, provide initial location information and notify the SAR response organization. Responding is done by specialized federal government organizations (DND and CCG) on specific standby readiness supplemented by DFO vesels for marine response. Aiding can be done by any craft or marine vessel on scene and volunteer organizations and craft of opportunity also provide, to varying degrees,

TABLE 1-1
SAR OPERATIONS RESOURCES

OBJECTIVE ACTIVITY	TASK	RESOURCE				
		DOT/CATA	DOT/CCG	DND	DFO	OTHER (CRAFT OF OPPORTUNITY, VOLUNTEERS)
ALERTING	DETECTING	AIR TRAFFIC SERVICES 7 ACC 116 FSS FLIGHT PLANNING AND ALERTING SYSTEM RADAR EMERGENCY RADIO FREQUENCY MONITORING — ELT — VOICE	VESSEL TRAFFIC SERVICES VTM — RADAR ECAREG/NORDREG SYSTEMS SAIL PLANS RADIO FREQUENCY MONITORING — EPIRB — VOICE	AIR TRAFFIC & DEFENCE CONTROL TOWERS RADAR EMERGENCY RADIO FREQUENCY MONITORING — ELT — VOICE	FREQUENCY MONITORING — AIR & MARINE EMERGENCY FREQUENCIES	FREQUENCY MONITORING — AIR & MARINE EMERGENCY FREQUENCIES
	LOCATING	EMERGENCY RADIO FREQUENCY MONITORING — VOICE — ELT VHF/DF — CONTROL TOWER — FSS	RADIO FREQUENCY MONITORING — VOICE — EPIRB VHF/DF — MARINE RADIO STATIONS — SOME LIGHT HOUSES	EMERGENCY RADIO FREQUENCY MONITORING — VOICE — ELT VHF/DF — CONTROL TOWERS	EMERGENCY RADIO FREQUENCY MONITORING — VOICE — ELT VHF/DF	EMERGENCY RADIO FREQUENCY MONITORING — VOICE — ELT
	NOTIFYING	PRIORITY COMMUNICATIONS — TELEPHONE — TELETYPE	PRIORITY COMMUNICATIONS — DEDICATED SAR CIRCUITS — TELETYPE — TELEPHONE	PRIORITY COMMUNICATIONS — DEDICATED LINES — TELEPHONE — TELETYPE	RADIO — VHF	RADIO — VHF — CB TELEPHONE
	SERVICE TO ABOVE	COMMUNICATIONS — A/G/A — TELETYPE AIDS	COMMUNICATIONS — MARINE RADIO — TELETYPE	COMMUNICATIONS — A/G/A — LONG RANGE RADIO — DEFENCE NETWORKS	COMMUNICATIONS — MARINE RADIO — TELETYPE	COMMUNICATIONS — MARINE RADIO
RESPONDING	REACTING		STANDBY: 30 MINS 24/7/365 VESSELS CLASS 5 X 600 6 X 500 5 X 400 14 X 300 2 X HC 8 X 100 29 X IRB 69	STANDBY: 30 MINS OR 2 HRS 24/7/365 AIRCRAFT 1 X CC130 7 X CC115 9 X CH113/113A 3 X CC138 3 X CH135 23	STANDBY: 30 MINS FOR SPECIFIED PERIODS VESSELS 16 MULTI-TASKED VESSELS OF VARIOUS CLASSES	CMRA — VOLUNTEER VESSELS — 5 CCG REGIONS OTHER — PEP — RESCUE 15 — BCLI CASARA (PLANNED) — VOLUNTEER PILOTS — PEP — CARES — SEMAD — MACAP — OTHERS PRIVATE — CIVIL COMPANIES IN FRONTIER AREAS VESSELS OR AIRCRAFT OF OPPORTUNITY
	TRANSITTING & SEARCHING		ALL WEATHER CAPABILITY FOR MOST LARGE VESSELS VHF/DF	ALL WEATHER CAPABILITY WITHIN LIMITATIONS OF TYPE OF AIRCRAFT VHF/DF SPOTTERS	ALL WEATHER CAPABILITY FOR AREA OF OPERATIONS VHF/DF	
AIDING	DEPLOYING		VESSELS ABOVE — AID OR TOW	AIRCRAFT ABOVE ROTARY WING — HOIST — DAY OR NIGHT	ALL VESSELS — AID OR TOW	ALL VESSELS — AID OR TOW
	ASSISTING		MEDICAL AID — EMT OR FIRST AID TRAINED CREW	MEDICAL AID — PARA MEDICS — ALL TERRAIN DEPLOYMENT CAPABILITY	MEDICAL AID — FIRST AID TRAINED CREW	MEDICAL AID — FIRST AID
	EVACUATING		AS REQUIRED — STRETCHER SPACE	AS REQUIRED — STRETCHER & SARTECH MEDICAL SUPPORT	AS REQUIRED — STRETCHERS	AS AVAILABLE

Responding and Aiding services. Primary SAR aircraft and vessels are equipped to provide most kinds of aid or tows. Medical aid or assistance to survivors of air distresses is a more complex problem. Trained rescue specialists provide more capable medical assistance at accident sites often difficult to reach and where treatment for accident trauma is required.

Control, Co-ordination and Communication

1.6 Response to a SAR event is controlled by four Rescue Co-ordination Centres (RCCs), primarily operated by DND, and two SAR Emergency Centres (SARECS) operated by CCG. The SARECS report to Halifax and Trenton RCCs as pertinent for operational direction beyond their purview. Each Search and Rescue Region is controlled by a military commander who ensures that SAR operations are executed to meet that Region's demands. Communications to support the control function are provided by existing CATA, CCG, DND and commercial telephone, radio and teletype networks.

Survivability

General

1.7 No matter how efficient the SAR alerting and responding systems are, it is unlikely that rescue from an air or marine distress will ever be immediate except in the occasional fortuitous instance. Consequently, it is incumbent on aircraft and boat operators to carry sufficient aids to survival so that following distress, they can improve their own chances of survival until rescue comes. The kind of aids and equipment will vary depending upon how far the boat or aircraft ventures from settled areas and the most effective alerting aid used to obtain help. For example, an aircraft flying over the sparsely settled regions of the country will require, in case of forced landing, an inventory of survival equipment capable of sustaining all on board for several days. A pleasure boat in difficulty in a heavily travelled area like the Georgia Straits will require primarily life jackets for its occupants and signalling devices in anticipation of relatively quick assistance by other boats.

1.8 In short, because notification and transit times for both air and marine rescue resources will take time, aircraft and boat operators must have on board, equipment to help them survive for a practical period and to assist in their location until assistance can reach the scene.

Survival Following an Air Distress

Survival Probability

1.9 The data on survival following an aircraft accident lead to mixed conclusions. Two Canadian sources state the following: in SAR related aircraft accidents, the fatalities from injuries sustained at impact are 49%[1] by an earlier DND study for the years 1969-1973 (261 cases), 56.7% for the period 1976-1980 from TC statistics (323 cases)[2] and, for comparison 65% in the United States as reported for 1980[3]. For overall distresses, many of which do not involve a crash, the ORAE study indicates that the survival rate is 70%[1]. SAR manuals commonly use the USAF Arctic Desert Tropic Information Center's (ADTIC) data of the 1960's for estimating survivability, but there is doubt as to the applicability of this information to the Canadian scene.

1.10 Figure 1-1 illustrates a study done within DND for three and one-half years of data from 1975 to 1978[4]. Searches following air distresses located 544 persons. The basis of measurement is different from that cited above because these data represent successful searches and results are measured in people rather than SAR incidents. Over 54% of the survivors are from accidents with no fatalities and over 60% of the persons located were alive when found. In cases where survivors are found, 96% of all persons recovered were located within two days of the initial alert of the SAR forces. Figure 1-1 and other studies illustrate several points related to the above:

a. Over 90% of survivors are located within 48 hours with the greatest percentage within 24 hours. After this period, the probability is very high that few of the victims will be alive.

b. Beyond about eight days, only chance survivors are found although these individuals may survive for several weeks. Of the seriously injured survivors of a crash, evidence shows that the majority will probably succumb within six hours of the crash, a relatively short life expectancy.

Location

1.11 Other than for ELT's, there is little data for assessing the value of specific aids that assist visual and electronic location of an aircraft in distress. In a general sense, ELT's with 11% in distress alerts and visual sightings with 21% represent a third of the total air distress alerts. Aids that could improve sighting time or assist in cases of overdues and subsequent visual searches would obviously shorten location

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[1] Causes, Survival Rate and Incidence of Poor Weather Affected Distress Air Cases, ORAE Report No. 57, Sep 1975, (Data 1969-1973).

[2] DOT Injury Index: Accidents Involving SAR (1976-1980)

[3] AFRCC Annual Report - 1980, USAF 26 June 1981

[4] A Military Paper to Assess the Cost Effectiveness of Current Canadian SAR Operations, ATGHQ 1 Dec 78

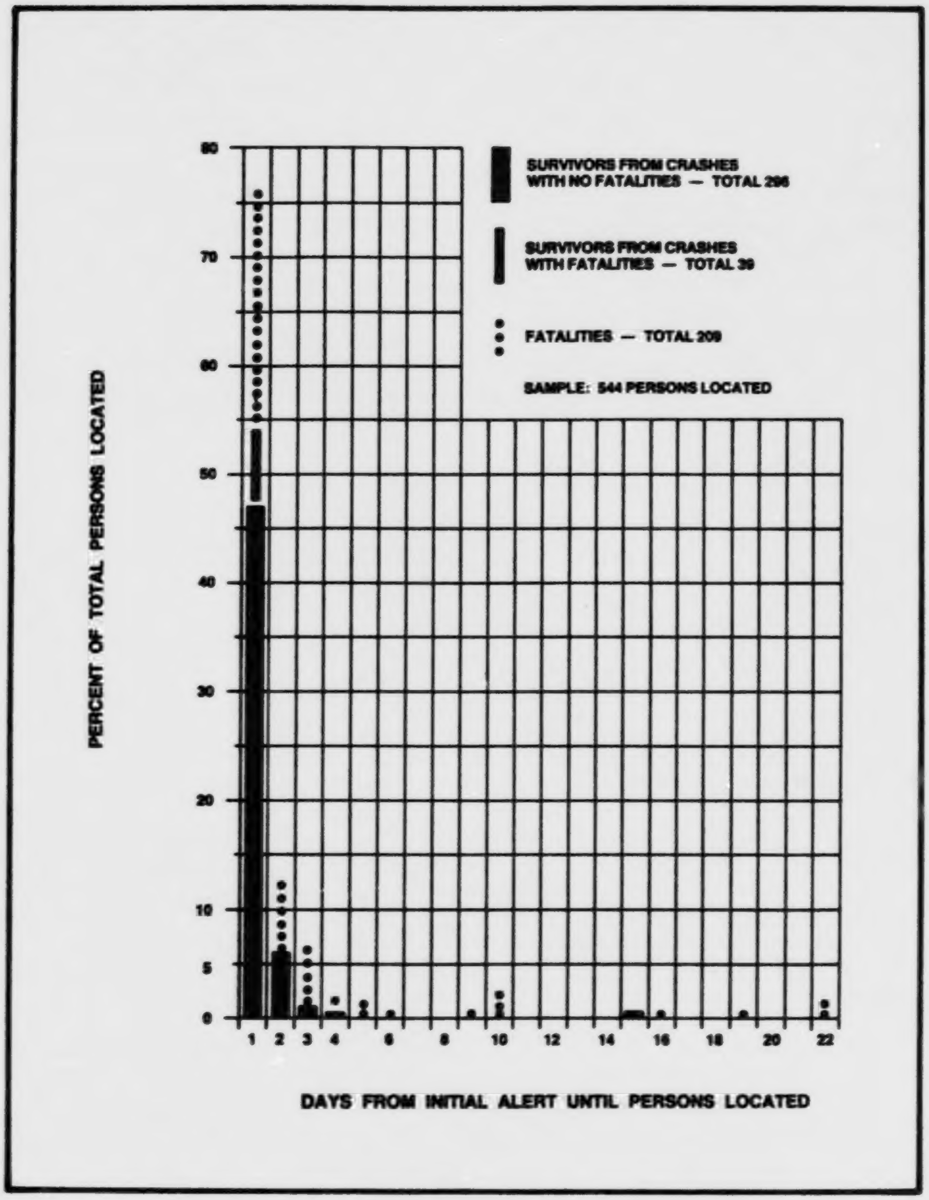

FIGURE 1-1 SURVIVAL ASPECTS OF DISTRESS AIR CASES IN CANADA
1 JAN 75 — 30 JUN 78

time. The role of locating aids in finding downed aircraft needs further study. The role of the ELT is obvious but the use of visual aids such as high visibility for aircraft paint schemes, flares, signal mirrors, smoke, signal fires and sighting panels should be better defined. A perfectly working ELT system coupled with satellites would provide notification of a distress within a few minutes to one hour, regardless of the existence of survivors. This would be the desirable goal.

Need for Self Help

1.12 The value of survival gear has not been measured. Most survivors of an air distress face at least 24-48 hours before rescue. Cases have occurred where survivors died of exposure when shelter was only a quarter of a mile away, but did not have clothing to protect them from the raging blizzard that had originally caused the forced landing. Protective clothing and a basic food supply are essential for human survival; however, the roles of individual items and their collective use have not been effectively assessed.

1.13 The worth of aids to assist in location is commented upon above. Given the difficulties of visual search methods, survivors can improve their chance of being located, although once again data evaluating the subject is obscure.

1.14 Self help should be encouraged through the carriage of survival equipment and visual locating aids in the light of:

a. the ground and weather conditions likely to be faced following an air distress,

b. the time required for rescue resources to provide aid,

c. the need to guide search aircraft in order to shorten the time of locating downed aircraft.

Observations

1.15 In considering the provision of resources for SAR air response and goals for their level of service, the following points on survivability are pertinent:

a. There is an approximate 70% survival rate of persons on board an aircraft that experiences a distress.

b. There is an approximate 35-50% survival rate of persons on board an aircraft that crashes.

c. Persons who survive a crash but who are seriously injured will probably survive only six hours or less.

d. The majority of the survivors (over 90%) should have aid delivered to them within 48 hours. Beyond this time, the likelihood of survival decreases sharply.

e. Survivors should be equipped with appropriate clothing, food for several days and some major first aid equipment.

f. Survivors of the aircraft should have visual and self-actuating electronic locating aids to improve the chances and shorten the time of being found. Regardless of survivability rates, each individual search will be conducted initially on the assumption that there are survivors.

g. The federal SAR organization should conduct thorough studies into all aspects of survivability in the air world to define these points more accurately.

Survival Following a Marine Distress

Survival Probability

1.16 Survival time on or in the water is usually much shorter than on land. However, there is likely to be proportionately less chance of accident or burn trauma thus producing a medical problem different from that in the air world. Two circumstances apply to a marine distress. In the first, persons on board can remain out of the water on a boat or liferaft, for example, following a mechanical breakdown and their survival time is closely related to the fate of their craft. In the second case, people are immersed in the water as the vessel burns, sinks or individuals have fallen overboard. The second case requires the most examination. Death from hypothermia is the greatest threat for a victim in the water. For much of the year in Canadian water, survival time for persons in normal clothing is less than one hour's immersion and may be as short as a few minutes in the winter.

1.17 A general overview of Canadian water temperatures[5] in areas of federal SAR concern and where recreational boating predominates is shown below. Survival times come from Figure 1.2:

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[5] Climate Atlas of North America Mean Sea and Lake Surface Temperatures. June 1970

	MEAN WATER TEMPERATURES (°C)		SURVIVAL TIME	
REGION	FEBRUARY (lowest)	AUGUST (highest)	WINTER (minutes)	SUMMER (hours)
VICTORIA	+5° - 7°	+12° - 16°	30-100	3.5+
TRENTON	+1°	+19° - 22°	20-70	5.0+
HALIFAX	-1° - +1°	+12° - 15°	15-20	1.1-3.5

Survival times assume optimum conditions and can be reduced very quickly by swimmer activity, wind or waves. For fishing boats that venture farther from shore, operate more of the year and into more difficult water or vessel conditions, the survival times are likely to be shorter also. The warmer summer temperatures exist for only about two or three months of the year and fall quickly either side of the August peak.

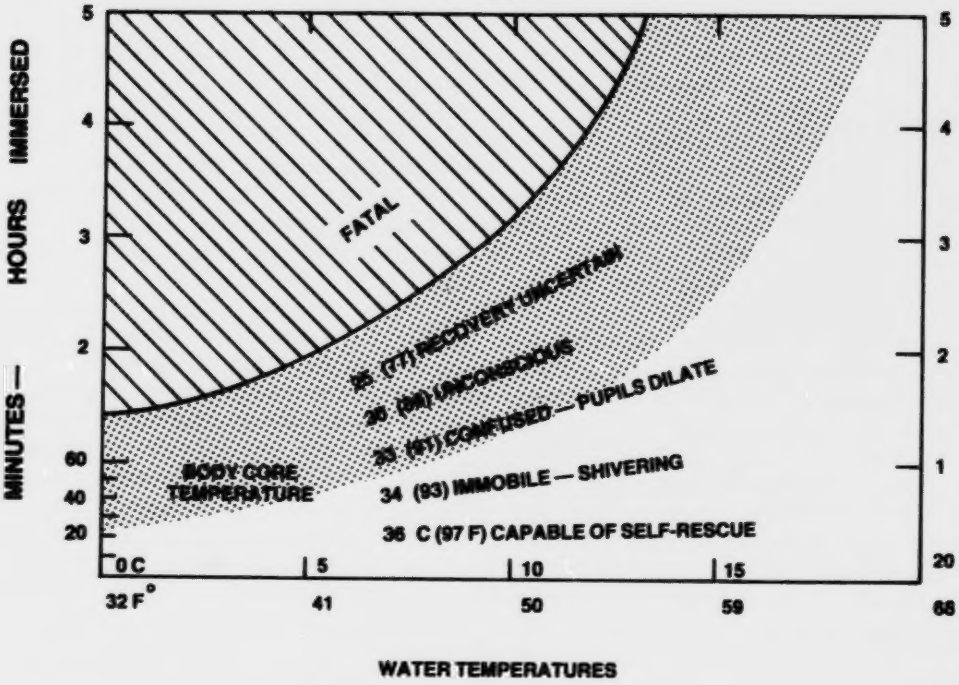
1.18 The SAR response organization is faced with the problem of aiding water-immersed survivors of marine distresses within the time periods suggested above. In many cases, this is clearly impossible and the boater must obviously improve his own survivability time. Where high boating traffic occurs, other vessels are likely to be in the vicinity. This is supported by the preponderance of visual alerts (47%) as the main way in which others are aware that a boat is in difficulty. The survival task for a boater in trouble is to get someone's attention and secondly, to improve his chances of surviving in the water if he is immersed. This latter point implies the need for flotation equipment, thermal protection and signalling devices.

Location

1.19 In the marine world, electronic location has so far had less applicability, only six cases in five years. Because as noted, the recreational boater is most likely to be assisted by other small craft in the vicinity and because the sheer numbers of small boats pose the danger of saturating emergency frequencies, EPIRBs should be used judiciously. However, EPIRBs, coupled with SARSAT, offer an opportunity for more rapid rescue for offshore vessels and those operating in more remote areas. Radios and visual signalling devices such as flares and signal flags should become the main methods of requesting help for recreational boats and small fishing vessels.

Need for Self Help

1.20 Data on the value of survival gear in rescues is sparse in SARSTATS. However, much of its need is self-evident. Flotation gear is necessary to support victims in the water. Flotation gear offering thermal



APPROXIMATE SURVIVAL TIMES

FOR ADULT — LIGHT CLOTHING
— WITH FLOATATION

REDUCE TIMES SHOWN BY HALF (APPROX.)
- VERY ACTIVE OR DROWNPROOFING
- CHILD-SIZE BODY
- EXHAUSTED

MULTIPLY TIMES SHOWN BY —
1.4 • KEEPING STILL
1.5-2 • USING HELP OR HUDDLE
2 • WARM CLOTHING AND HOOD
4 • U-VIC FLOATER IN H.E.L.P.
6 • WET SUIT

FIGURE 1-2 LIFE EXPECTANCY IN WATER

protection is even more necessary for persons operating in water with temperatures of 15°C or less. Useful studies have been done on this subject [6,7], but little has been incorporated in SAR education literature. Location assisting and notifying devices are necessary either by dedicated emergency channels on radio or by visual devices. Following a distress, specific amounts of time are needed to alert the SAR system or another boat, time for the assisting boat to travel the distance and time to locate the people in difficulty. During this aggregate time, the people on the boat in distress or in the water should themselves have the means to shorten the time taken to request assistance and to survive until help arrives. This time could be thirty minutes to two hours or more. Thus the colder the water, the more survival capability that must be on board the vessel up to and including immersion suits.

Observations

1.21 To enhance survival following a marine distress, the following considerations apply:

(a) Elapsed time is the major problem of survival in the water and requires first, flotation gear and secondly, protection from hypothermia.

(b) Survival time for unprotected persons in the water is relatively short, 15 minutes to one hour, during about nine months of the year.

(c) The marine public must be encouraged to help themselves extend their survival time with adequate flotation gear that offers thermal protection. They also should carry a means of alerting the SAR system quickly and assisting an aiding vessel to locate them expeditiously.

(d) Federal SAR or marine safety organizations should sponsor correlated studies of flotation aids and thermal protection methods which would result in standards and regulations suited to the Canadian problem.

(e) Studies should also be made of the possible saturation of the SAR locator frequency and of other visual signalling methods such as inflatable balloons.

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[6] Hayward. Eckerson and Collis. Thermal Balance and Survival Time Prediction of Man in Cold Water. June 27, 1974

[7] Hayward, Eckerson and Collis. Thermographic Evaluation of Relative Heat Loss Areas of Man during Cold Water Immersion. July 1973

THE SAR TIME LINE

Nature of the Time Line

1.22 The unfolding of the series of events that mark the stages of a SAR incident provides an excellent method of examining the entire operations process. These events are depicted as a time line in Figure 1-3. They may be viewed from three separate perspectives: that of the client of the system, that of the Federal SAR Program and that which is specifically the concern of the SAR response system. Two definitions are important in examining the time line. An event is the beginning or completion of an act at a specific time. An activity represents the consumption of resources over a period of time that began and/or ended with an event.

1.23 The client sees the sequence of events as the incident occurring, survival (where pertinent), the appearance of a rescue vehicle and the rescue process that moves him to medical care, safe haven or return to normal operations. The SAR Program views the operations process primarily from the time the incident occurs until it delivers aid to the client, followed by a concern for the assistance and evacuation process. The SAR response system sees the incident as its concern from the time the RCC is notified until the SAR resources involved are released from the specific incident. It also must deal with the recovery and replenishment of the SAR resources, but these activities are outside the time line as it pertains to the client.

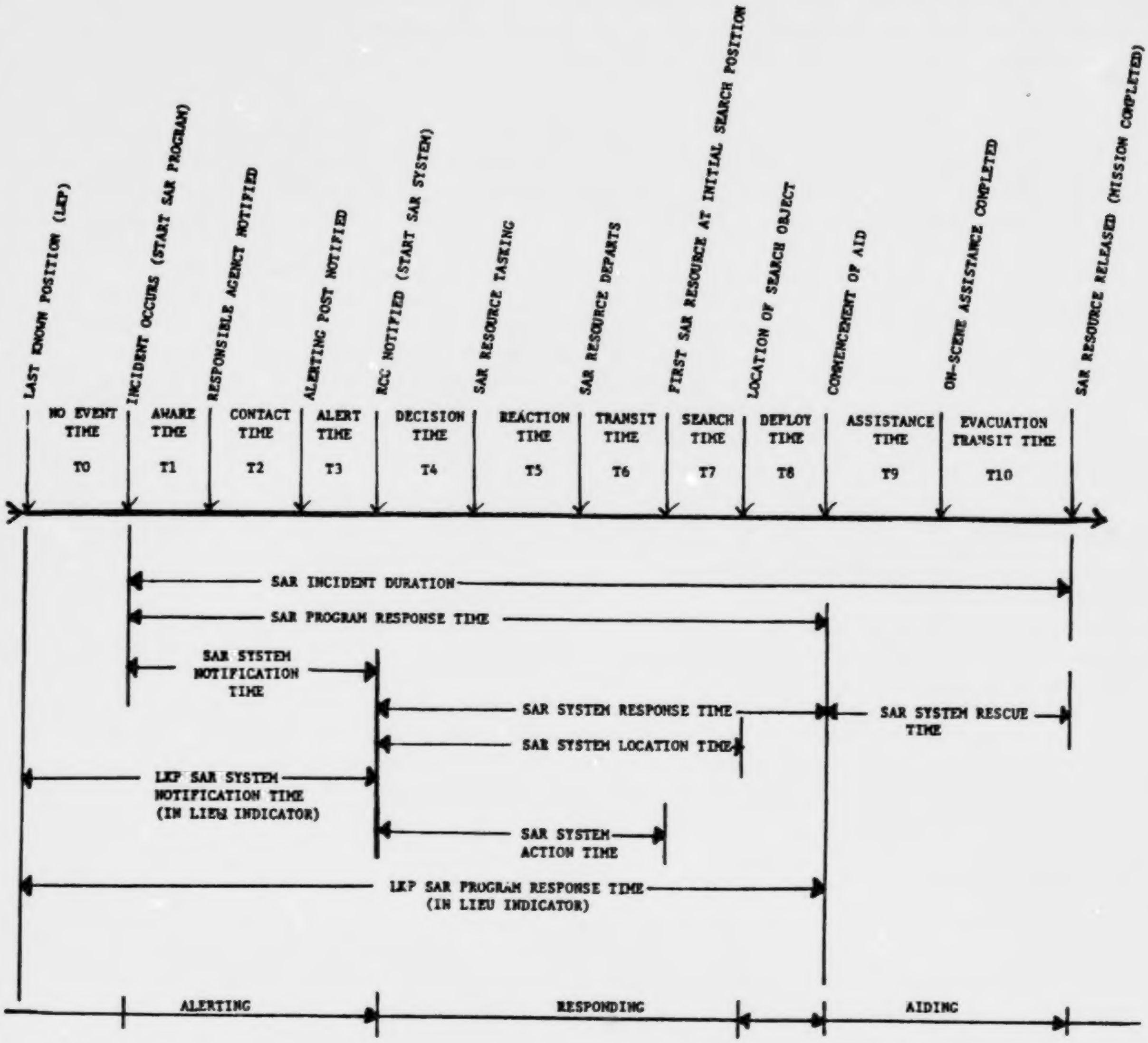
Events on the Time Line

1.24 The time line (Figure 1-3), is a series of sequential or concurrent events, showing the steps by which an incident occurs and is handled. Each of the eleven interval times between the events (T0 to T10) represents a series of activities which will result in a positive, negative or zero time value according to the nature of the incident. Aggregates of the activities provide the information for indicators and measures of operations of the SAR Program or the SAR Response System.

Benchmarks on the Time Line

1.25 The first significant time is that when the incident occurs. However, this event seldom happens under controlled circumstances. Hence, frequently this time is not known. In the air world primarily, the only event close to the incident time is the time of the Last Known Position (LKP). Use of this time to generate measures of performance has limitations but often the LKP is all that is available. Measures using this indicator are used instead of an accurate occurrence time when LKP is all that is known.

1.26 The time when the RCC is made aware of the incident starts the dedicated SAR response system. Until that point, the dedicated SAR


LAST KNOWN POSITION (LKP)
INCIDENT OCCURS (START SAR PROGRAM)
RESPONSIBLE AGENCY NOTIFIED
ALERTING POST NOTIFIED
RCC NOTIFIED (START SAR SYSTEM)
SAR RESOURCE TASKING
SAR RESOURCE DEPARTS
FIRST SAR RESOURCE AT INITIAL SEARCH POSITION
LOCATION OF SEARCH OBJECT
COMMENCEMENT OF AID
ON-SCENE ASSISTANCE COMPLETED
SAR RESOURCE RELEASED (MISSION COMPLETED)
NO EVENT TIME T0
AWARE TIME T1
CONTACT TIME T2
ALERT TIME T3
DECISION TIME T4
REACTION TIME T5
TRANSIT TIME T6
SEARCH TIME T7
DEPLOY TIME T8
ASSISTANCE TIME T9
EVACUATION TRANSIT TIME T10
SAR INCIDENT DURATION
SAR PROGRAM RESPONSE TIME
SAR SYSTEM NOTIFICATION TIME
SAR SYSTEM RESPONSE TIME
SAR SYSTEM RESCUE TIME
SAR SYSTEM LOCATION TIME
LKP SAR SYSTEM NOTIFICATION TIME (IN LIEU INDICATOR)
SAR SYSTEM ACTION TIME
LKP SAR PROGRAM RESPONSE TIME (IN LIEU INDICATOR)
ALERTING
RESPONDING
AIDING

SAR INCIDENT TIME LINE

FIGURE 1-3

resources are not brought to bear on the incident except in the case where a SAR resource triggers the system. For example, a Coast Guard or a DFO vessel may encounter a boat in distress, provide aid, then notify the RCC. In this case, T6, T7and T8 will be small or zero, and T4 and T5 will be zero. In the case of an aircraft in distress, first reported to an airport manager or police officer as responsible agency who in turn notify a Flight Service Station (Alerting Post) which then communicates with the RCC, T2 and T3 will both have positive time values.

1.27 The next significant point constitutes a first goal in the SAR system. Commencement of aid for the victims of the incident represents the point at which a step is taken to relieve their suffering or improve their condition. Hence, it is chosen as the immediate goal of the SAR Program and the response system.

1.28 Finally, the time line terminates, not at the time the RCC closes the case but, at the time the SAR response resource places injured survivors in an ambulance at an airport or hospital helipad, or the line is dropped from a towed boat in safe haven, or similar circumstances that allow the rescue resource to proceed to base or to another incident. The recovery, replenishment and re-crewing times, where required, are contained in the measures of dispatch capabilities in T5 and are reflected as the ability to dispatch a resource to a subsequent incident.

Measures

An Approach

1.29 A measurement system of the important activities and events on the time line requires three categories, the specific players or events, then the numbers of such groups and finally the performance of the SAR Program[1]. To be discussed in Section 3, these final measures can then be compared to goals and standards for specific activities and levels of service stated for the air and marine portions of the SAR Program. The outcome should be a useful indication of the efficiency and effectiveness of the Federal SAR Program operations.

Description

1.30 Table 1-8 identifies a structure for descriptions of the SAR system. It illustrates what might be required and is not intended to be all-inclusive. The majority of these descriptions could be recorded in existing SARSTATS, thus the addition of only a few would provide the basis for a sound measurement system. Several descriptors presently in SARSTATS could be deleted.

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[1] For an expanded view, see:

MOSCRIP J.G. Preliminary Analysis of SAR Effectiveness Indicators, DND/DAOR, STAFF NOTE 81/4. Ottawa, Feb. 1981.

TABLE 1-8

EXAMPLES OF SAR OPERATIONS DESCRIPTORS - AIR AND MARINE

THE CLIENT	SURVIVAL	THE INCIDENT	RESPONSE ACTION
Aircraft or Boat Details: - Equipment & Capabilities Persons On Board Operators: - Experience & Training Causes of Incident Trip Details: - Purpose - Voyage Plan	Persons: - Survivors Before & After SAR System Notified - Degree of Injury - Fatalities - Causes of Injury or Death Survivability: - Craft Design & Condition - Survival & Safety Equipment - Alerting Equipment Survival and Fatality Times Assistance Cases (Non-Distress) Persons and Property Helped	Category: Air, Marine Humanitarian, Civil Type of Distress/Non-Distress Severity Weather & Water Conditions All Time Line Events Navigation or Other Aids Reactivated Cases Geographical Data - Region & Coordinates - Distance from Shore & Rescue Base Property Value (Marine)	Alerting Methods RCC Role Response Craft - Primary/Secondary - Volunteer/Opportunity - Number - Characteristics All Time Line Activities Search Details Location & Rescue Details Assisting Details - Tow, etc. Hours Sailed or Flown Costs

Basic Indicators

1.31 The first level of SAR effectiveness indicators relates directly to the time line. Each time interval (activity) represents the time taken to accomplish an event. Aggregation of these over many incidents will provide a measure of how the system is performing. Other indicators are:

a. Numbers of SAR incidents:

   (1) total, kind, distress, non-distress,
   (2) responded to by a SAR/Non-SAR resource,
   (3) false alarms, other.

b. Aggregates of all pertinent aspects of all four categories of descriptors, the client, survival, the incident, response action.

c. Descriptors of the SAR scene, clientele and milieu as illustrated in Part II.

SAR Program Indicators

1.32 The SAR "Incident" is at present the first unit of measurement of the SAR Program. Incidents are each event by which the RCC is notified of an aircraft, vessel or person in need or potentially in need of assistance. The magnitude of these individual incidents varies from a major passenger carrier disaster to a false alarm such as the sighting of debris in the water which turns out to be a floating log. The term "incident" is far too encompassing and this primary measure of Program activities should be divided into major and minor events. Some qualifier should be used when the term "incident" is used in discussion of the SAR Program.

1.33 From a management level, the SAR Program indicators should follow the pattern illustrated below. Analysis of annual trends will provide a picture of where the Program is going. The indicators are for operation activities only for there is, at present, no definitive method for measuring the results of prevention activities.

a. Program Demands or Workload

   (1) Number of SAR Incidents,
   (2) Number of Distress Incidents, or Major SAR events - Air and Marine,
   (3) Number of Non-Distress Incidents, or Minor SAR events - Air and Marine,
   (4) Number of Non-SAR Incidents: Humanitarian and Civil,
   (5) Number of Incidents requiring SAR Resource activity by type of SAR resource.

b. Program Resource Inventory to Accomplish Workload

(1) Aircraft, vessels, personnel, departments, RCCs, squadrons, stations, management and staff resources and, where applicable, federally funded or given some contributions - Volunteers, Air and Marine.

c. Program Resource Expenditures

(1) Air Hours Flown related to major and minor SAR events, as well as humanitarian and civil aid incidents,
(2) Vessel Hours Sailed related to major and minor SAR events as well as humanitarian and civil aid incidents,
(3) Operating Costs,
(4) Total SAR Program Costs:
    -- Operating and Maintenance Costs,
    -- Capital Expenditures,
    -- Person Years.

d. Program Results

(1) Lives saved in Distress Incidents,
(2) Lives lost both before and after the SAR system is notified,
(3) Persons otherwise assisted in Non-Distress Incidents,
(4) Persons assisted in Humanitarian and Civil Events,
(5) Value of Property Saved in Distress/Non-Distress Events (Marine),
(6) Value of Property Lost (Marine),
(7) Number of Craft Assisted/Saved.

e. Program Effectiveness

(1) Ratio of lives saved in relation to those that could have been saved (aim for annual improvement or optimum goals),
(2) Ratio of Persons Assisted,
(3) Degree of accomplishment of level of service,
(4) Efficiency in meeting specific goals such as standby status, reaction time, etc.,
(5) Cost effectiveness of primary forces/volunteer forces.

Observations

1.34 For the sequence of events that describes the process of a SAR incident, it is noted that:

a. The specific point at which an incident begins also marks the beginning of the SAR operations phase of the Program. The time at the Last Known Position of the object craft may have to be the substitute benchmark for the time the incident begins.

b. The first goal of operations is to provide aid at the scene of an incident that begins to improve the lot of the survivors. The time at which this occurs is a Program datum.

c. An organized system of descriptors and indicators is necessary to measure the performance of the SAR Program and ultimately provide a measurement of its effectiveness.

d. The first unit of measure of the SAR Program, the "incident", requires redefinition into major and minor classifications.

GLOSSARY OF DEFINITIONS

1. Incident	An event where one or more individuals are in a situation where injury or death is a possible outcome and the individual(s) has lost control of his immediate environment.
2. SAR Incident	An incident where the SAR system was alerted, including false alarms, whether or not actual distress was subsequently discovered.
3. Distress	An incident where life is in jeopardy or where significant discomfort to victims would lead to physical harm if aid is not rendered. Distress incidents will have a 1 or 2 level of severity.
4. Severity	Degree of exposure to harm or injury.
5. Level of Severity	Level 1 - Extreme probability of imminent death Level 2 - Risk of death or severe injury Level 3- Little or no immediate risk of death or injury.
6. SAR Notification	The transmittal of information to the SAR response system that an incident has occurred.
7. SAR Response System	The structure that has the authority to commit resources to the saving of life and protection of property.
8. SAR Resource	A resource tasked to respond physically to a search and rescue incident. A SAR resource may be a primary, suplementary, secondary or other resource.
9. Primary SAR Resource	A SAR resource which is fully funded by the federal government, is under direct authority of RCC for SAR tasking, is specifically equipped, configured and manned for SAR, with a professionally trained SAR crew.
10. Supplementary SAR Resource	A SAR resource which is fully or partially federal government funded, or volunteer, is under direct authority of RCC for SAR tasking in the event of a SAR incident, holds a state of readiness to respond to SAR tasking, may carry limited additional equipment and whose crew may have some training in SAR basics. Includes multi-tasked craft, CMRA, and CASARA.
11. Secondary SAR Resource	A SAR resource which possesses some inherent capability to respond to SAR, in terms of equipment and/or training, is not subject to direct tasking by RCC but

	may be tasked through other commands or as a craft of opportunity.
12. Other SAR Resource	A SAR resource with little or no inherent capability to respond to SAR, but which, from time to time, may be tasked as a craft of opportunity.
13. Opportunity	The condition that exists when a craft is in an advantageous position to provide assistance on its own initiative or to be tasked as first response to a SAR distress.
14. SAR Resource Tasking	The assignment of a mission to a resource capable of taking appropriate life-saving action.
15. Last Known Position	The last positive observed or known position of a vessel or aircraft as established by a responsible authority or official air or marine agency.
16. No Event Time	The unknown time period between the last known position of a craft until a SAR incident subsequently occurs.
17. Aware Time	The time interval between the occurrence of an incident and a responsible agency learns of the event.
18. Responsible Agency	A person or persons whose normal or official capacity involves knowing what action to take and performing that action upon learning of an overdue craft or receiving the report of a SAR incident i.e. police, airport personnel, marine operators, relatives, etc.
19. Contact Time	The time period required for a responsible agency to notify an alerting post of a SAR incident.
20. Alerting Post	A unit designated to receive information from the general public regarding aircraft or vessels in emergency and to forward the information to the associated RCC, (ICAO), i.e. a flight service station or a marine radio.
21. Alert Time	The time interval required by an alerting post to notify an RCC of a SAR incident.
22. Rescue Co-ordination Centre (RCC)	A unit responsible for providing efficient organization of a search and rescue service and for co-ordinating the conduct of search and rescue operations within a search and rescue region (SRR) (ICAO).
23. Decision Time	The time period required by an RCC to verify a notification and to determine whether to commit resources after learning of a SAR incident.

24. Reaction Time	The interval of time elapsed from receipt of SAR resource tasking until the SAR resource departs its base en route to the scene of the incident.
25. Transit Time	The interval of time elapsed from launch of the SAR resource to its arrival at an initial search position.
26. Search Time	The interval of time elapsed from arrival of the first SAR resource at an initial search position until either the search object is located or the search is suspended.
27. Search	The act of attempting to locate a search object.
28. Location	The arrival at, overhead or alongside the search object.
29. Deploy Time	The time elapsed from location of the search object until aid to survivors is first provided.
30. Assistance Time	The time expended in the provision of on-scene assistance to survivors.
31. Evacuation Transit Time	The time elapsed from the point when on-scene assistance is completed until the SAR resource is released after survivors or the aided vessel have been taken to safety.
32. Mission Complete	The time at which a SAR rescue unit delivers an aided person or vessel to safe haven or medical authority.

SECTION 2 - OPERATIONS ACTIVITIES

Operations

2.1 The SAR Program Logic Diagram outlines Operations as one of the major groups of activities in delivery of the Program. For the public, operations is the most obvious aspect of SAR and it provides the first level of service, that of saving lives. Operations also consume the majority of SAR resources: money, person years, aircraft and vessels. The increasing cost of Operations is a major factor in the increasing cost of SAR. In light of the structure outlined in the previous section, Operations activities will be examined as they are now, observations will be drawn from available data, and findings of the Evaluation Team will be integrated into the appropriate sections. The overview provided by Part III, Section 1, Table 1-1 places each of the three groups of activities (alerting, responding and aiding) and the associated nine operations tasks in their relative perspective.

The analysis of these activities and tasks follows the format of the Table.

Alerting

2.2 The first concern after a SAR distress or incident is that someone who can provide aid should know it has occurred and that help is needed. The second challenge is to locate the site of the distress. The SAR system tasks that pertain to these concerns are detecting, locating and notifying. There are two major methods of becoming aware of an incident: one, a witness gives aid or notifies an agency that can; or two, the government communication and monitoring systems that provide service to normal air and marine navigation learn of the incident and notify the SAR response system in accordance with pre-arranged procedures.

All the existing systems will be assessed in the following pages.

2.3 For the future, the system offering the most significant potential for alerting (detecting and locating) is an electronic locator device coupled with satellite-aided detection and location of distress sites. The ELT/EPIRB/SARSAT combination offers the potential for fairly rapid alerting and location information and also assists SAR resources in locating the search object. As will be noted shortly, the time taken to alert the response system is usually considerably longer than the time taken to respond. Consequently there is considerable value in improving SAR effectiveness by shortening the alerting time by electronic and satellite means.

Alerting Systems - Air

2.4 The system for detecting air distresses relies mainly on procedures which require a pilot to file either a flight plan or a flight notification stating his flight particulars and intentions. If he does not close his flight plan or complete the planned flight, the air traffic service agency reacts. At prescribed times after the flight, based on the estimates of arrival at destination, the aircraft is declared overdue and the response system is alerted. Telephone and teletype checking procedures called communication searches verify that the aircraft is truly missing and search aircraft are launched as necessary. Direct alerting of a distress by other means, such as calling for aid, produces an immediate response to render assistance.

2.5 The alerting response activities are shown in the following tables.

TABLE 2-1 AIR DISTRESSES - METHODS OF ALERT (1976-1980)

ALERT METHOD	1976	1977	1978	1979	1980	TOTAL	PERCENT OF FIVE YEAR TOTAL
1. OVERDUE	71	64	83	51	56	325	45.1
2. AIRCRAFT INITIATED							
- RADIO	20	38	39	39	27	163	22.6
- ELT	19	17	11	11	11	76	10.6
3. OTHER INITIATED							
- VISUAL & TELEPHONE	27	26	31	29	29	153	21.3
- RADAR	0	1	2	0	0	3	0.4
TOTAL CASES	137	146	166	148	123	720	

(SOURCE: DND SARSTATS)

TABLE 2-2A - AIR NON-DISTRESSES (A3,A4,A5)

METHODS OF ALERT 1976-1980

ALERT METHOD	VICTORIA					EDMONTON					TRENTON					HALIFAX					NATIONAL TOTALS				
	1976 3 4	1977 3 4	1978 3 4	1979 3 4	1980 3 4	1976 3 4	1977 3 4	1978 3 4	1979 3 4	1980 3 4	1976 3 4	1977 3 4	1978 3 4	1979 3 4	1980 3 4	1976 3 4	1977 3 4	1978 3 4	1979 3 4	1980 3 4	1976 3 4	1977 3 4	1978 3 4	1979 3 4	1980 3 4
1. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2. [illegible] [illegible] [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3. [illegible] [illegible] [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] (A5)	0	0	0	0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]																					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
																					[illegible]				

[illegible]

TABLE 2-2B

AIR NON-DISTRESSES (A3, A4, A5)

DISTRIBUTION OF ALERT METHODS 1976-1980

	PERCENT OF REGION TOTAL				PERCENT OF FIVE YEAR NATIONAL TOTAL				FIVE YEAR NATIONAL TOTAL	
ALERT METHOD	VICTORIA	EDMONTON	TRENTON	HALIFAX	VICTORIA	EDMONTON	TRENTON	HALIFAX	INCIDENTS	PERCENT
1. OVERDUE	21.3	57.8	40.9	32.8	14.8	37.0	24.9	23.3	3,667	37.7
2. AIRCRAFT INITIATED										
RADIO	18.2	4.2	6.3	42.2	25.8	5.1	7.8	61.3	1,794	18.4
ELT	50.9	34.7	45.6	22.1	35.0	22.0	27.5	15.5	3,704	38.1
3. OTHER INITIATED										
VISUAL	5.7	1.2	3.9	0.9	50.8	10.1	30.8	8.3	285	2.9
OTHER	3.6	1.2	2.2	1.8	42.8	13.0	22.4	21.8	215	2.2
4. NO INFO	0.3	0.7	0.7	0.2	15.9	38.6	36.4	9.1	44	0.5
5. REOPENED	0.0	0.3	0.4	0.0	0.0	47.4	47.4	5.2	19	0.2
TOTAL NON-DISTRESS INCIDENTS	2,547	2,344	2,229	2,608					9,728	100.0

Table 2-3 Overdues - Communications Searches by FSS - 1980

38 Stations sampled. Total Flight Plans/Notes Processed - 710,250

NUMBER OF SEARCHES	NUMBER OF FSS	CUMULTATIVE
30+	3	3
25-29	1	4
20-24	3	7
15-19	6	13
10-14	9	22
5-9	6	28
-5	10	38

(SOURCE: DOT/CATA/DAFP/A)

*Majority of Communication Searches are resolved within 20 minutes.

Table 2-4 Air Distresses - LKP SAR System Notification Time

Time from last known position to RCC notification

TYPE OF FLIGHT INFORMATION	TIME (HOURS) (ALL RCCS)
FLIGHT PLAN	2.9
FLIGHT NOTIFICATION	14.3
COMPANY PLAN	17.4
NO PLAN	24.5

(SOURCE: DND SARTSTATS 1976-78)

Observations

2.6 The above tables provide a number of observations with respect to detecting air SAR incidents:

Distress

(a) Overdues represent the most significant (45%) means by which the alerting system learns of an air distress.

(b) Flight Plans constitute the quickest means for triggering the SAR system response on overdues.

(c) Self-initiated alerts by pilots using aircraft radios are significant to getting responses (23%) for air distresses.

(d) ELT's are an additional aid but do not yet provide a major method of distress alert.

(e) A FSS probably handles no more than 10-14 median class communications searches each per year compared with an average of over 6000 flight plans/notes processed annually.

Non-Distress

(f) False alarms resulting from overdue on flight plans and ELT's are the major means of alerting RCCs to air non-distress incidents. The relationship of false alarms to air non-distresses is:

	OVERDUES	ELTS
(1) Percentage of all non-distresses (A3,A4, A5)	38	38
(2) Percentage of all A3's only	44	46

Alerting Systems - Marine

2.7 The marine alerting system relies mainly on the mariner himself or someone seeing him in difficulty to notify the SAR system. Closely controlled systems of float plans and vessel traffic control do not exist or are not used by pleasure craft and small fishing vessels. Tables 2-5A&B and 2-6A&B illustrate proportionally how the SAR system is notified of a vessel in trouble. Over five years, the national distribution of methods of alert shows that, in distresses, visual means are most important (47%) and in non-distresses the radio is the major method (45%). Where pleasure craft abound, someone else is likely to see and report a problem (visual alert) as exemplified in the Trenton and Victoria Regions. Emergency Position Indicating Radio Beacons are carried as yet on relatively few vessels so that in spite of their considerable potential, they are not a numerically significant marine detecting aid. Overdues are most significant in Halifax where the fishing boat population operates from a berth or harbour where the

TABLE 2-5A

MARINE DISTRESSES (M1 & M2)

METHODS OF ALERT - 1976-1980

ALERT METHOD	VICTORIA	EDMONTON	TRENTON	HALIFAX	NATIONAL
1. Overdue	53	4	96	105	258
2. Vessel Initiated					
Radio	321	2	118	93	534
EPIRB	0	0	1	5	6
3. Other Initiated					
Visual	525	2	251	29	807
Other	25.	0	35	33	93
4. No Information	7	0	9	0	16
Total M1 & M2 Cases	931	8	510	265	1,714

TABLE 2-5B MARINE DISTRESSES (M1 & M2) - DISTRIBUTION OF METHODS OF ALERT (1976-1980)

ALERT METHOD	PERCENT OF REGION TOTAL				PERCENT OF FIVE YEAR NATIONAL TOTAL				5 YR. NATIONAL TOTAL	
	VICTORIA	EDMONTON	TRENTON	HALIFAX	VICTORIA	EDMONTON	TRENTON	HALIFAX	INCIDENTS	PERCENT
1. Overdue	5.7	50.0	18.8	39.6	20.5	1.6	37.2	40.7	258	15.1
2. Vessel Initiated										
Radio	34.5	25.0	23.1	35.1	60.1	0.4	22.1	17.4	534	31.2
EPIRB	0	0	0.2	1.9	0	0	16.7	83.3	6	0.3
3. Other Initiated										
Visual	56.4	25.0	49.2	10.9	65.1	0.2	31.1	3.6	807	47.1
Other	2.7	0	6.9	12.5	26.9	0	37.6	35.5	93	5.4
4. No Information	0.7	0	1.8	0	43.8	0	56.2	0	16	0.9
	931	8	510	265					1,714	100

SOURCE: DND SARSTATS

TABLE 2-6A

MARINE NON-DISTRESS (M3) - METHODS OF ALERT 1976-1980

ALERT METHOD	VICTORIA					EDMONTON					TRENTON					HALIFAX					NATIONAL				
	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80
1. Overdue	327	327	349	432	430	5	1	4	9	10	120	140	139	169	175	113	137	171	186	147	565	605	663	796	762
2. Vessel Initiated																									
Radio	831	1191	1502	1678	1634	0	0	3	4	2	55	143	187	257	314	581	596	658	733	833	1467	1930	2350	2672	2783
EPIRB	24	20	10	18	7	2	0	0	2	0	16	4	1	1	5	0	0	0	0	0	42	24	11	21	12
3. Other Initiated																									
Visual	955	1024	1157	1447	1381	5	13	26	16	61	191	344	462	658	795	75	64	189	165	110	1226	1445	1834	2286	2347
Other	34	124	117	186	115	1	6	0	16	8	54	38	28	76	189	29	52	15	16	77	118	220	165	294	389
4. No. Information	13	1	7	19	10	0	0	5	0	2	9	7	11	16	7	3	1	2	2	1	25	9	20	37	20
Total M3 Cases	2184	2687	3142	3780	3577	13	20	38	47	83	445	676	828	1177	1485	801	850	1035	1102	1168	3443	4233	5043	6106	6313

SOURCE: DND SARSTATS

TABLE 2-6B

MARINE NON-DISTRESSES (M3)
DISTRIBUTION OF METHODS OF ALERT (1976-1980)

ALERT METHOD	PERCENT OF REGION TOTAL				PERCENT OF 5 YR. NATIONAL TOTAL				5 YR. NATIONAL TOTAL	
	VICTORIA	EDMONTON	TRENTON	HALIFAX	VICTORIA	EDMONTON	TRENTON	HALIFAX	INCIDENTS	PERCENT
1. Overdue	12.1	14.4	16.1	15.2	55.0	0.9	21.9	22.2	3,391	13.5
2. Vessel Initiated										
Radio	44.5	4.5	20.7	68.6	61.0	0.1	8.5	30.4	11,202	44.6
EPIRB	0.5	2.0	0.6	0	71.8	3.6	24.5	0	110	0.4
3. Other Initiated										
Visual	38.8	60.2	53.1	17.2	65.3	1.3	26.8	6.6	9,138	36.4
Other	3.8	15.4	8.3	3.8	48.7	2.7	32.6	16.0	1,186	4.7
4. No Information	0.3	3.5	1.2	0.2	44.0	4.9	44.0	7.1	111	0.4
Total M3 Non-Distress	15,370	201	4,611	4,956					25,138	100

family or others are likely to know of the overdue and notify the SAR organization. Communications searches (category 3-C) for vessels thought to be in distress but which eventually led to successful communication occurred in 1727 cases over the period 1976-80 or 7% of all non-distress cases.

Observations

2.8 Examination of marine operations points out that:

(a) Visual methods of alerting have proven significant to vessels. This fact should support regulations on the carrying of signal devices for attracting visual attention.

(b) For the marine world, the radio is a major asset in notifying the SAR system of the need for help. This should lead to the encouragement of installing radios on boats whenever possible when they travel out of sight of marina or harbour. It also suggests the use of dedicated emergency channels on VHF/FM and CB radio, the widespread monitoring of all "guard" channels by marine radio stations, commercial vessels and possibly also the development of automatic triggering devices for the emergency frequency on listening stations.

(c) Although the use of float plans in the marine world is encouraged, their main use should be for voyages that go beyond radio or visual contact.

(d) The Department of Communications should increase its enforcement of the regulations for the use of distress-frequencies and channels.

2.9 During its interviews and travels, the Team met marine and air radio operators, air traffic system members and Transport Canada regulatory authorities involved in the alerting activity. In addition to the observations just recorded, it was noted that for the detecting, locating and notifying of SAR incidents:

(a) ICAO is satisfied with Canada's standards and practices for SAR and its alerting systems;

(b) observations by air administration regional staffs stressed that the use and misuse of VFR flight plans could be improved by :

  (1) notifying stopover airports of the intended flight,

  (2) imposing fines when flight plans are not closed because of carelessness or negligence,

  (3) further education and enforcement to encourage pilots to file flight plans in accordance with air regulations;

(c) all aircraft and vessels should be required to monitor emergency or "guard" frequencies;

(d) emergency beacons could be made more useful and less a source of false alarms by:

  (1) mandatory installation in all aircraft as soon as possible,

  (2) reducing false alarms through better designed beacons, and education on their use for operators and technicians,

  (3) mandatory installation of EPIRBS on specific classes of inshore and all off-shore vessels;

(e) the majority of FSS and marine radio stations require the installation of VHF/DF equipment;

(f) marine VHF communications sites are needed all around Newfoundland and along the North shore of New Brunswick;

(g) the one hour overdue time for VFR flight plans before triggering the SAR system is satisfactory;

(h) co-located VTM/Marine Radio/SARECS at one location are an effective combination for alerting SAR response resources;

(i) marine radio stations do not pass their record of communication searches to RCCs;

(j) many DFO vessels and CCG vessels cannot home on EPIRBs because they do not have the necessary VHF DF homers for the 121.5 MHz distress frequency;

(k) in the marine world, greater use of voyage plan or position reporting procedures would enhance SAR alerting for vessels travelling between two points in NORDREG or ECAREG areas;

(l) Overdue procedures have less applicability for vessels than for aircraft;

(m) the marine public is generally unaware of the need for speed in notifying RCCs/SARECs of a SAR problem nor does it know how to use the emergency radio network;

(n) CB radios are widely available among the boating public but are disliked and not monitored by marine radio stations and RCCs because of the abuse of frequencies;

(o) marine emergency frequency channel 16 has become an information channel instead of a safety channel and is too often cluttered with routine traffic;

(p) the non-enforcement of licensing and education for marine radio operators results in poor use, poor procedures and a lack of knowledge of the emergency networks;

(q) FSS procedures for flight plan handling/communications and searches/response to emergencies are well disciplined, standardized and monitored;

(r) VFR flight planning services in the Toronto area are inadequate. The FSS is too difficult to contact by telephone with the result that pilots disregard the requirement to file flight plans because they are more concerned with getting their flight underway.

Responding

General

2.10 As illustrated by the Time Line, the total activity of Responding to a SAR incident begins when either the RCC is notified or a SAR resource begins assistance on its own initiative. Depending upon circumstances the RCC controller either acts almost immediately, or as is more often the case, must verify the facts or obtain more information. He then tasks a SAR resource to locate and assist the aircraft or vessel in distress. The reaction of the SAR resource depends upon its standby status, the circumstances of the incident, etc. Most primary and many supplementary SAR units have standby status times. The standby reaction times are normally either thirty minutes, two hours or immediately for vessels on patrol. Thirty minutes or less means that a cocked aircraft or vessel and crew is ready to launch when tasked. In many cases the ready aircraft can be airborne within a few minutes but usually time is taken to prepare maps, plan the specific search and to ensure the safety of the SAR aircraft. Boats can usually be underway more quickly. Two hours standby implies home standby, that is, designated and ready crews who require time to move from residence to dock or airport, prepare to launch, then depart. Two hours is a consistently adequate time for this process. Other timeline factors are often more critical than standby status within the total response activity, consequently more attention will be addressed to them.

2.11 Transit time is a direct consequence of the distance between the location of the incident, the base of the SAR resource and the speed with which the resource can reach the scene. Dash speed in either aircraft or vessels has some importance but is not always an end in itself. All events on the Time Line make up the response time and transit is only one. If, in the marine world for instance, the water is fairly calm, a fast boat is important to marine response. In more difficult seas, however, a vessel probably cannot use all its speed because of the rough travel. A hovercraft overcomes much of this in inshore waters and its speed is a distinct advantage.

2.12 Search time varies from virtually none (more likely in the marine world) to several weeks for an unsuccessful air search. Searching in the air, or in the offshore water can be a complex challenge focused on the difficulty of sighting an object even if in its vicinity, and the probability of even searching in the right area. Search strategies are based on experience, navigation skills and data derived from past incidents. Computer assisted search methods exist and are used primarily to develop techniques and procedures. A full scale search is organized under a Search Mission Coordinator (SMC) and/or a Searchmaster. Much needs to be done to improve visual search methods and strategies, especially in the air world. The flying hours utilized in air searches represent the main operational cost of air SAR. Should the ELT/SARSAT program perform to its promise, searches should be considerably reduced in time or effort with a total shortening of the time line activities as the result. Notwithstanding, the Evaluation Team endorses the attention that the Operations Research staff of Air Transport Group Headquarters devote to improving the effectiveness of visual searching. More effort should be directed from a broad perspective to improving the total effectiveness of alerting and responding in an organized way, tackling each activity on the time line, with the object of achieving a significant reduction of flying hours.

2.13 Upon location of the object being searched for, the aiding craft must then provide or deploy assistance to the persons on board. In most marine cases this means boarding, towing or giving some kind of mechanical assistance. The circumstances may be difficult but are normally within the marine skills of the vessel operator. The air world often faces the more difficult problem of getting aid to survivors at remote sites. Specially trained SAR technicians execute this task. Should they be unable to reach the site directly because of night, wind or other weather conditions, deployment may take some time. Little is gained by creating more casualties, therefore caution is exercised to ensure that the SAR technicians are delivered safely and uninjured to the accident scene. Hence, deployment time may take from a few minutes for a helicopter landing to an overnight delay when wind or other weather problems will not permit a safe deployment.

Data

2.14 Considerable time was spent during the evaluation in attempting to assess the specific times within the Responding activity. Computer analysis of SARSTATS II (Enhanced) produced results of doubtful value owing to missing data and inconsistent reporting. Manual methods brought some results for air data as tabulated below but SARSTATS proved very difficult to work with. For example, distributions of times by classes would have been desirable but could not be rationally extracted from the records. Some RCCs report well, others do not. Data on the Time Line that are readily available to the Controller such as Decision Time (T4) and Reaction Time (T5) are commonly reported. The harder the data is to get, the less likely it is to be recorded. Although this is a natural situation, it makes the use of performance indicators for measuring the System very difficult. All discussions of times should be related to the SAR Incident Time Line (Figure 1-3, Section 1). Additionally, it should be noted that much SARSTATS data frequently shows evidence of not being audited for completeness and accuracy, yet it remains crucial to analysis of SAR operations. Finally, the design of the information categories does not solicit all the information necessary.

Responding - Air

2.15 The DND primary SAR resources shown in Table 1-1 provide the main federal government resource for air response to SAR occurences. As reported earlier, these aircraft and secondary DND aircraft provide 82% of the flying hours for SAR response of all kinds. This represents a fairly well focused operation.

2.16 The standby, or alert status of DND aircraft varies from thirty minutes to two hours. Until fairly recently, the thirty minute standby period for squadrons corresponded approximately to the normal daily working day of 0800 to 1630 hours, five davs weekly, Monday to Friday. Two Regions, Trenton and Victoria, have shifted their standby periods within the week to match the peak SAR activity periods of time of day or weekend days for both Regions. This change creates inconveniences for the home lives of crews already committed to an extended work week and must, therefore, be employed judiciously. However, there is no evidence that all Regions have evaluated the circumstances and planned their shortest standby time to correspond to the peak SAR activity period of their area. Part II, Section 3 of this Report identifies the peak time period for each Region.

2.17 Achievement of launches within the thirty minute or two hour time period is closely monitored by squadron commanders, base operations, Air Transport Group and Air Command operations staffs. SAR units are very successful at launching within the target times. Delays are discretionary decisions to enhance the mission for effectiveness or safety and are correctly within the responsibility and judgment of the aircraft commander for the specific circumstances of the launch. However, subsequent to the launch and if the time taken is outside the mandatory period, the decision will be reviewed by his superiors.

2.18 The time the SAR System takes to respond to Air incidents is illustrated in the following Tables. Table 2-7 is adapted from a DND study* and Table 2-8 is an analysis from SARSTATS. The times given are representative indicators only. The individual averages in Table 2-8 do not necessarily come from the same cases, therefore the data T4 to T8 cannot be added to create an average SAR System Response Time. Some indication of the accuracy of each time may be taken from the number of cases for which data was available.

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* A Study of SAR Helicopter Response, 3385-15 (CADO), DND, 24 November 1980.

Region / Times	Victoria					Edmonton					Trenton					Halifax					National Range of Times
	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80	76	77	78	79	80	
Notification (T0-T3) Cases	13.4 16	4.7 15	8.8 22	8.2 12	9.1 15	7.0 15	11.9 17	9.8 14	18.3 21	4.3 12	17.6 20	3.0 20	5.8 19	11.8 28	14.8 28	44.9 6	12.3 4	4.2 1	5.0 3	- -	3.0 - 44.9 288
Decision (T4) Cases	2.8 19	1.1 20	0.9 30	0.5 20	1.7 25	4.4 22	2.8 19	2.4 24	5.9 19	4.1 10	2.5 28	2.8 19	1.1 27	1.1 26	1.0 19	1.7 13	2.6 13	2.4 10	0.7 8	4.3 6	0.5 - 5.9 377
Reaction (T5) Cases	3.3 16	1.4 16	2.9 26	1.9 19	0.8 24	1.5 21	1.4 20	1.5 24	2.3 22	1.9 10	1.9 23	1.2 20	2.2 28	1.4 27	1.9 19	3.3 9	2.6 10	1.2 10	1.6 8	9.7 7	0.8 - 9.7 359
Transit (T6) Cases	1.7 16	1.7 18	1.7 27	1.4 18	2.5 20	2.0 19	2.4 21	1.6 22	1.7 21	1.6 10	2.2 14	1.9 16	1.9 19	2.5 18	2.3 16	1.7 11	1.7 1	1.2 2	1.2 8	1.2 4	1.2 - 2.5 301
Search (T7) Cases	24.4 14	5.8 15	8.3 16	26.6 13	12.6 16	6.8 19	16.4 16	8.6 19	32.7 19	6.1 8	21.8 20	6.3 9	13.5 20	15.3 17	9.2 11	8.2 5	- 0	3.4 2	5.4 3	9.4 4	3.4 - 26.6 246
Deploy (T8) Cases	10.4 3	0.5 3	0.8 5	1.4 3	1.9 3	4.8 8	4.0 9	4.5 11	6.7 16	3.7 5	1.6 6	1.7 1	1.6 3	3.8 7	1.0 3	1.8 1	- 0	1.6 1	- -	- -	0.5 - 10.4 88
Actual Response (T4-T8) Cases	28.8 23	7.1 24	10.7 31	19.6 19	13.9 23	14.6 22	14.6 23	15.5 23	69.0 21	11.4 9	20,6 29	8.3 22	13.8 27	14.9 28	10.3 17	12.0 16	10.8 12	6.3 10	4.8 9	19.5 7	4.8 - 28.8 395
RCC Notified (TX) To Case Closed	65.2 23	19.0 25	49.8 27	59.5 16	29.4 15	25.2 20	36.6 23	21.6 11	67.5 18	18.9 8	39.6 27	20.3 15	23.8 20	36.7 25	10.5 17	43.0 17	18.9 12	9.9 11	49.5 10	21.0 7	10.5 - 65.2 347
Cases With Data Maximum Minimum	23 3	25 3	30 5	19 3	25 3	22 8	23 9	24 11	22 16	12 5	29 6	22 1	28 3	28 7	28 3	17 1	13 0	11 1	10 0	7 0	30 0

Source: SARSTATS

TABLE 2-8

REPRESENTATIVE AVERAGE SAR SYSTEM AIR RESPONSE TIMES (HOURS)

A1 CASES 1976-1980

TABLE 2-7
AVERAGE RCC DECISION TIME (T4)
1976-1978 (Time in Hours)

TYPE OF FLIGHT	VICTORIA	EDMONTON	TRENTON	HALIFAX	NATIONAL
Flight Plan	2.6	1.6	0.4	1.5	1.5
Flight Note	0.9	3.3	2.1	6.6	2.5
Company Plan	1.9	9.7	4.3	3.9	4.7
No Plan	9.7	6.3	10.1	23.3	10.3

(Based on 213 cases) SOURCE: SARSTATS

2.19 Table 2-8 illustrates the representative response picture within the appropriate statistical cautions. Of the total of 737 air distresses over five years, 560 were A-1 distresses which required a dedicated SAR resource response. Only times drawn from A-1s successful in finding a search object are used in this table. Thus it can be seen that only 67% of the most closely controlled cases (373 out of 560) were sufficiently recorded for analysis. The entry reporting actual SAR system response time is one of the better kept data indicators. Because these cases do not include the much larger number of air hours employed in unsuccessful searches, the proportionate time of Search Time (T7) is in reality far greater in relation to other Time Line activities than is illustrated here.

2.20 Tables 2-4, 2-7, and 2-8 are cumulative. The first two provide an aggregate illustration of the effect of the various methods of flight planning on the passage of time before a resource is launched. Table 2-9 is a representive aggregate time for notification by all methods without discriminating as to the flight planning method.

Response Time vs Notification Time

2.21 Examination of the relative magnitudes of times reveals one startling conclusion. In general, the time taken to notify the SAR system of an incident (T0-T3) and the decision to launch (T4), collectively far exceeds the time to get a resource to the search or rescue site. It would be logical to examine each activity and event between T0 and T4 as fertile ground for areas to improve the functioning of the entire Operations activity.

Observations

2.22 Tables 2-7 and 2-8 suggest several points:

(a) The type and precision of a flight plan are important in shortening the RCC Decision Time and expediting the launch of a SAR resource.

(b) Edmonton has the longest decision times, a fact which probably reflects the difficulty of obtaining information about aircraft over its large, sparsely-settled area with its incomplete communications capabilities.

(c) Average transit times aggregated annually are relatively short and are under two hours in the majority of cases. This indicates that SAR air bases are probably well located for responding to air distresses.

(d) The time taken to learn of a SAR incident and determine whether or not to launch a SAR resource is in general significantly longer than the process of launching and flying a SAR aircraft to the incident site.

(e) Decision and reaction times are generally greater than transit times. This indicator added to the length of notification time demonstrates that it takes longer to learn about, verify and launch a response, in general, than it does to execute the flight to the area of the incident.

(f) Searches consume the majority of the aircraft hours spent in responding to a distress. Methods of shortening search time offer the most fruitful way of saving air search resources.

(g) The range of times presented for Time Line activities suggest the order of the time goals which could be set for the SAR Response System.

Responding - Marine

2.23 Marine response resources come from a wide variety of vessels, Canadian government provided such as CCG, DFO and RCMP plus a large group of volunteer craft. Vessels of opportunity figure very largely in the marine world, both government and civilian, in answering calls for assistance.

2.24 The data which record the elements of Response Times in SARSTATS are either of doubtful quality or non-existent for the years 1976-1979. For 1980, there is a more stable reporting base and the Evaluation Team has utilized that year's information as representative of the marine activities of the SAR Time Line. From each SRR, three sub-areas have been chosen: one with a high number of distress incidents; one with a medium number of incidents; and a sub-area with difficult environmental conditions. These latter criteria are applied to five years of data to categorize the sub-area although the Table represents the 1980 experience only. The results are displayed in the following Table for four of the elements of the Time Line.

M-1s represent response time by a dedicated SAR resource and M-2s are response by a non-dedicated resource, usually a vessel of opportunity.

2.25 Table 2-10 is derived from five years of data and depicts the number of hours vessels expended in distress incidents and how various SAR vessel categories, the CCG, DFO, Civilian and others responded. From this data, the Table displays the average utilization rate for all distress cases and for those to which dedicated resources responded.

Observations

2.26 Data in Tables 2-9 and 2-10 provide the following observations:

(a) These times substantiate the use of vessels of opportunity as the best means of achieving the SAR objective of saving lives. The data also highlight how valuable it is in reducing decision time that all vessels in transit should have either position reporting procedures or use transponders in radar environments.

(b) It is noticeable that the decision time required by the RCC appears to lengthen according to the distance of the incident site from the RCC. This is probably accounted for by communication searches and determination of the availability of vessels of opportunity.

(c) In the Victoria Region, dedicated resources for M-1 cases handle 66% of all distresses but use only 45% of the hours indicating that CCG/DFO handle the shorter distance incidents. Similarly, in Trenton SRR, 63% of distresses require only 46% of the hours. However, in Halifax SRR, 78% of the incidents use 82% of the hours indicating that CCG/DFO vessels handle the longer distance incidents. These observations are further substantiated by the average utilization rates for all distress and for M-1 distress cases.

Resourcing - Air

2.27 For air SAR response, the task of providing round-the-clock ready response resources 24 hours per day, 7 days per week, 365 days per year (7/24/365) becomes the pacing factor for the minimum number of aircraft required per SAR squadron. To hold this capability, with one aircraft always ready to launch with a high degree of reliability, a minumum of three aircraft and five crews are necessary*. Because of the random effect of aircraft unservicabilities and the planned effect of maintenance schedules, if only two aircraft are assigned for SAR there will be no aircraft

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* A Study of SAR Helicopter Response, 3385-15 (CADO), DND, 24 November 1980.

TABLE 2-9

REPRESENTATIVE MARINE SAR SYSTEM RESPONSE TIMES - DISTRESSES 1980

(MINUTES)

REGION / TYPE OF SUB AREA	MOST ACTIVE		MEDIUM ACTIVITY		DIFFICULT ENVIRONMENT	
Type of Distress	M1	M2	M1	M2	M1	M2
Victoria	303		304		307	
No. of Cases (M1 & M2)	78		35		34	
Decision Time (T4)	4	0*	9	10	55	2
Reaction Time (T5)	2	0+	2	4	12	5
On Scene Time (T6-T8)	11	6	25	28	15	8
Response Time (T4-T8)	25	9	31	23	75	12
Trenton	108		104		106	
No. of Cases	11		11		6	
Decision Time (T4)	132	0*	55	6	22	4
Reaction Time (T5)	40	2	12	10	27	0+
On Scene Time (T6-T8)	25	15	60	59	171	50
Response Time (T4-T8)	144	19	67	30	180	50
Halifax	011		007		034	
No. of Cases	6		9		6	
Decision Time (T4)	2970	340	200	135	21	201
Reaction Time (T5)	24	37	13	7	80	2
On Scene Time (T6-T8)	252	141	20	340	22	150
Response Time (T4-T8)	280	1254	61	440	460	50

* 0 Time as reporting vessel is responding vessel.

+ 0 Time as responding vessel is itself.

TABLE 2-10

VESSEL-HOURS UTILIZED IN DISTRESS CASES 1976-80

VESSEL OWNER	VICTORIA	EDMONTON	TRENTON	HALIFAX	NATIONAL
CCG	2,921	112	1,508	2,496	7,037(46)
DFO	614		59	656	1,329(8)
Civilian	3,219		614	239	4,072(27)
Other	1,168		1,254	441	2,863(19)
	7,922(25)	112(1)	3,435(22)	3,832(25)	15,301
Average Hrs All Distress	8.5 hrs	14 hrs	6.7 hrs	14.5 hrs	8.9 hrs
Average Hrs. Ml Distress	5.7	14	4.9	15.2	7.2
% Dedicated Resources Utilized (CCG & DFO)	45%	100%	46%	82%	54%
From Table 3-16 % Ml of All Distress	66%	87%	63%	78%	67%

available for approximately 8% of the year. If three aircraft are assigned there will be no aircraft available for approximately one percent of the year. Four or more aircraft increase the certainty but are beyond optimum numbers. The crewing numbers assume sufficient crews to man a 30 minute standby for forty hours (30/8/5) per week. A requirement for 30 minute standby for a greater period would demand more crews. For example, 30/10/7 would require five and one-half crews, and 30/16/7 would require six crews. When all aircraft are unserviceable, SAR squadrons relatively close to one another or nearby secondary units could augment primary units but this is not normally a satisfactory solution in the Canadian context because of the distance between SAR bases.

2.28 This same number of aircraft and crews also provides some depth of resources when a search begins which requires multiple numbers of airplanes. The requirement for standby is waived and all squadron resources may be assigned to the search. DND secondary resources will be tasked next when more aircraft are necessary.

2.29 Consequently, to plan air resources for primary SAR response, the determining factor is the minimum number of aircraft and crews to hold the 24/7/365 standby posture. Inherent in this resourcing is the capacity to respond to SAR incidents/distresses and to provide the basic resources for searches. Additionally, the squadron will require more aircrew personnel as supervisors and searchmasters. However, within the stabilized milieu of air incidents and distresses, DND can normally handle air response with the aircraft and crews indicated for the type of aircraft as long as it also maintains the ability to multi-task its secondary resources when augmentation is necessary. However, this comment is made with the reservation that SAR qualified crews are essential for much of the difficult and specialized work of searching and rescuing.

2.30 Various views were expressed to the Team on the need for 30 minute standby by SAR aircraft as opposed to more two hour standby conditions. Resolution of this question is beyond the Team's purview but comment is necessary. Evaluation of standby requirements should be matched against the desired level of SAR response service and the survivability aspects of air and marine SAR. As previously noted, in the air world, it normally takes longer to learn of an incident than it does to respond unless significant search times are involved. Survivors on land have at least 24-48 hours if they are equipped for survival and are not seriously injured. Should the ELT/SARSAT combination work well then a need for faster response will develop and short notice standby will make more sense. Until then, standbys as short as 30 minutes for response to air incidents probably have a greater role as a public relations image than a necessity.

2.31 In the marine context, a rapid response is necessary. Survival times in water are short. Notification to the RCC may be slow and only a short time may be left to effect a successful rescue. Standby times as brief as possible are necessary in this instance and, for contrast, in one of its areas the USCG has reduced its local helicopter standby to twenty minutes. As a generalization, aircraft on standby for marine incidents should be able to launch as quickly as is safely possible.

Aircraft and Equipment

2.32 A number of characteristics desirable for SAR aircraft, their performance, equipment, capabilities and coverage were identified to the Team by Units. Assessment of these is properly the responsibility of DND. However, as the majority of the aircraft in service were originally designed for other or general purpose roles, some comment is made on their suitability for SAR.

2.33 Area Coverage. Commanders and Units made the following points:

(a) For Halifax Region: better fixed wing aircraft coverage is needed for the far reaches of the area - off Newfoundland, the Arctic and offshore to 30° West longitude. Summerside based aircraft lack the speed and endurance to provide this coverage. With the phase out of the Argus Maritime patrol aircraft in 1981, there is no capability in the area for far out-to-sea airdrop of rescue equipment. The replacement Aurora aircraft will not be airdrop certified until 1983. Canadian Hercules aircraft based at Trenton, which have some capability, are more than two hours flying time from the east coast and are being phased out of the primary SAR role. During the Team's interviews with operational personnel, it appeared tacitly, without mutual agreement with the Americans, that the Cape Cod based USCG C130s were expected to fill the role in the interim. Rotary wing SAR response over about one hundred miles at sea was chancy except for trips to oil platforms. The Team considers that the Gander Rescue Unit should not be reduced from three to two aircraft because of the possible loss in dispatch reliability to 90 percent. Ideally, the Region requires fixed and rotary wing aircraft with range, speed and endurance greater than exists at the present.

(b) For Trenton, Edmonton and Victoria Region: Although all the fixed wing aircraft coverage in these areas had limitations because of the kinds of aircraft, there were no significant difficulties. Trenton is providing a better suited fixed wing coverage with Buffalo aircraft effective 1 October 1981. Edmonton has compromise difficulties. The Twin Otter based at Namao is too small and short ranged and the Hercules is an overly capable and expensive resource for the normal SAR response. Edmonton Region lacks primary SAR rotary wing coverage but adapts by multitasking the Namao resident tactical helicopters when rotary winged aircraft are needed. This raises the question of the SAR qualifications of tactical helicopter crews although technicians from the SAR squadron usually travel on board. But the difficulties created by this compromise are best resolved by Air Command. The specific point raised by the shortfalls is that the next generation of SAR aircraft should be of the best possible design for Canadian SAR needs as defined by DND and not simply general purpose aircraft adapted a priori for SAR.

2.34 Aircraft Capabilities and Performance. Comments were registered in interviews as follows:

(a) Buffalo (CC 115): This aircraft was praised for its manoeuverability, STOL capabilities and for airdrop and search tasks. Its lack of mechanical reliability, inadequate anti-icing capacity, slow dash speed and for Halifax Region, inadequate range and endurance were handicaps. For Victoria, its lack of pressurization was a drawback for over-the-mountain flying.

(b) Twin Otter (CC 138): The Twin Otter was classified as an excellent short range, reliable STOL aircraft employed in an area that primarily needs a long range airplane. Owing to its size, the CC 138 was cramped for occupants to search from, more awkward for SAR technicians to don their equipment in and airdrop from, lacked an autopilot and had too short a range and endurance. In short, it is a good aircraft employed in the wrong role.

(c) Hercules (CC 130): This aircraft has all the necessary traits for long range SAR: reasonable dash speed, excellent size and comfort for crew and spotters, endurance, range and anti-icing capability. Its search speed is higher than that of the previous two aircraft but its inferior external visibility, reduces its relative ability as a search aircraft. For airdrop, it is excellent but its size, speed and associated manoeuverability constrains its operation in close terrain areas such as the mountains. It is more expensive to operate, but not significantly different from the Buffalo according to DND's per flying hour costing. The CC130 provides a very capable first response aircraft for SAR but it is somewhat less satisfactory for a continuing visual search. DND's main reluctance to employ the CC130 more widely is because SAR tasking reduces and complicates its availability for the major military roles for which it was acquired.

(d) Labrador/Voyageur (CH113/113A): As improved by SARCUP, the Search and Rescue Helicopter Capability Update Program, the CH113 promises to provide a very good SAR helicopter. No provision appears to have been made for attrition aircraft. The unit crews were satisfied with the aircraft in general, and in particular praised its twin-rotor advantages for SAR over a single tail rotor type. Crews identified its major lack as an Automatic Flight Control System (AFCS) for long SAR rescue hovers. From an employment viewpoint, the main deficiency in the CH113 was its relatively short range and endurance for marine rescues in the off-shore area of Halifax Region.

(e) Twin Huey (CH135): As adapted to its interim SAR role, crews and Units were pleased with this helicopter's capabilities within the state-of-the art of older helicopters.

2.35 SAR Equipment. Aircraft and SAR technicians require many kinds of specialized equipment unique to their role. In general, these are adequately supplied by DND within practical and safe limits. Shortfalls were identified as follows:

(a) VHF/FM Radios: Commanders at all levels and crews were unanimous in identifying the lack of VHF/FM aircraft installed radios for marine work as the major SAR equipment deficiency. Portable radios had been made available but these were unsatisfactory and diversionary to use during the intense work periods of rescue hoists. To require the SAR technicians to open a door or hatch, stick the antenna of a portable radio out and attempt to communicate with a vessel, then relay information to the pilots smacks of a Rube Goldberg solution at best and unsafe for crew and survivor at worst. The delay in providing aircraft-installed radios until as late as 1982 for Buffalo and Voyageur aircraft as part of normal improvement programs was an incorrect decision.

(b) SAR Technicians Requirements: To support their role, SAR technicians need improved communications equipment: i.e a lighter UHF radio to take into an accident scene instead of the heavy tactical PR-66 set currently in use, an air droppable HF set to enable them to communicate with the RCC or elsewhere when they are left at a remote site, and a helmet containing a radio and/or microphone for use when both hands are needed during hoists, survivor handling or other rescue work.

2.36 Research and Development: The development and SAR adaptation of advances in technology has no apparent focus or active programs. When interviewed, experts frequently suggested that, for example, infra-red technology might be applied to searching yet no one in authority could say whether or not such equipment had been assessed scientifically and evaluated operationally for SAR applications. DND generally stays alert to applying technology to its various roles through the Directorate of Air Requirements and Air Command planning and operations research staffs. Perhaps overwhelmed by emphasis on DND's major roles, the Air Operations policy staffs could name no structured R&D program to support SAR. In view of the great expenditure of aircraft hours in lengthy searches, such a program could have considerable merit.

Resourcing - Marine

2.37 Dedicated marine craft are available and crewed on a round-the-clock basis, 365 days of the year in those waters which are not ice-covered. Two ice-strengthened SAR cutters are utilized in the Newfoundland/Labrador areas and CCG icebreakers are available for secondary SAR purposes. During the refit period for the SAR vessels, other CCG or DFO vessels provide the SAR response. In sub-areas with a large number of pleasure craft, IRBs either of the inflatable or the whaler type are stationed and manned by summer students.

2.38 SAR craft, when not responding to a SAR incident, can be and are utilized in other CCG activities such as buoy checking, with the proviso that this task can be terminated immediately.

2.39 The existing determinant in marine SAR resourcing is the number of incidents occurring and in many cases the pressure applied by the public and politicians. There are no levels of service or standards against which resourcing can be evaluated or which can be used to illustrate the need for a new craft or a change of location for an existing one.

2.40 The public should be made aware of the response which SAR operations can provide and the criteria against which these are developed. They could then equip their vessels to ensure survival until the arrival of either a SAR vessel or a directed vessel of opportunity.

2.41 Many questions were raised as to the speed and performance capabilities of SAR vessels, particularly in the case of the new 22 metre 400 class vessel. This type did not meet its speed specification, has difficulty in handling stretchers and has no view astern from the wheelhouse for towing. Moreover its seaworthiness is questionable for some sub-areas to which it is or is being assigned. The new type 600 class Off-shore Supply Vessel is proving very capable and is highly thought of by the public and the CCG.

2.42 With the exception of the RELITE at Campbell River and the summer IRB's, all SAR craft are manned by full-time employees of the CCG. The RELITE is partially manned by volunteers and in this sub-area this has proved successful. The use of volunteers also lowers the cost of SAR and encourages the participation of Canadians who have a deep respect for the sea. During interviews with the Team, fishermen and their unions as well as other maritime associations and individuals emphasised the need for greater volunteer participation in SAR.

2.43 Foreign lifeboat services have developed or sponsored many designs, some of which would appear to be acceptable for Canadian conditions. The Royal National Lifeboat Institute which has 133 off-shore lifeboat stations and 122 inshore stations, some co-located with the off-shore stations, has developed or sponsored designs for offshore and inshore lifeboats which have proven both seaworthy and seakindly. Examples of these are the "ARUN" class of offshore boat and the "OMR 36" high speed rigid hull inflatable. The West German Lifeboat Society has developed a most interesting design, a "mother-daughter" boat whose daughter boat is launched and recovered via a stern ramp in the mother boat.

2.44 The time which SAR vessels, and other government vessels, spend in refit is excessive when compared with commercial vessels. The reason given is that even though there is a commitment as to a delivery date, the shipyard gives very low priority to government vessels. Neither penalties nor incentive bonuses are assessed to the yard. The net result is that government planning takes this delay into account which further exacerbates the situation. Other vessels are assigned to cover the refit period but their programs in turn are disrupted by having to continue in the SAR role.

2.45 Patrol vessels of the Department of Fisheries and Oceans have been used as an additional SAR resource in recent years. DFO vessels tend to follow the movement of the fishing fleets and so provide an on-the-scene SAR resource. The SAR organization identifies those areas where deficiencies in SAR dedicated resources can be covered by DFO. DFO is then incrementally funded so that such vessels can be manned on a round-the-clock basis and provided with additional SAR equipment for the required period. As more SAR dedicated vessels have been acquired the number of DFO vessels used for primary SAR has declined.

2.46 A further resource available for SAR purposes is the recently created Canadian Marine Rescue Auxiliary. The CCG screens volunteers carefully for their marine experience and the capabilities of their vessels. An RCC can call on a member of the CMRA to respond to a SAR incident. Since its formation the CMRA has participated in more than 1200 incidents. The ratio of CMRA members to the number of SAR incidents in 1980 in the Victoria SRR is 1:15 while in the Halifax SRR it is 1:4.

Contingencies

2.47 SAR response deals primarily with aircraft and vessels with only one to four people on board. Should a major air or sea carrier with a large crew or a large number of passengers experience a distress, rescue responses are necessary immediately. These are identified in the Logic Diagram as a major rescue problem. Within the jurisdiction of municipal and provincial organizations, there are many plans for responding to major air crashes, fires, etc., and various types of provincial or other emergency measures organizations have pre-organized plans for disasters. However, it becomes a SAR problem when lives are at stake in an air or marine disaster in a remote area or away from land. In all likelihood control, co-ordination and response start as a SAR response and grow from there to a full disaster response.

2.48 DND has made considerable progress in preparing and training to deal with a major aircraft disaster rescue in remote regions of the country. Standby aircraft and resources are prepared and equipped for this contingency. For marine disasters, CCG SAR organizations in Newfoundland and the Laurentian Region have conducted or participated in exercises for response to oil drilling platform and St. Lawrence River marine problems. However this latter initiative has been regionally based rather than nationally sponsored.

2.49 Major passenger carrier disasters in remote land areas or in off-shore ocean areas are likely to be SAR response problems. A comprehensive series of contingency plans with some level of training exercises would appear to be a responsibility of the SAR organizations. CCG/DND, Emergency Measures, Police and joint US/Canadian resources and procedures could then be identified and prepared, and training conducted. SAR would then be able to deal logically with the spectrum of rescue problems related to air and marine transportation for one to one thousand survivors. The objective would be that SAR managers could immediately draw on prepared and tested plans if an event similar to the "Princendam" marine rescue of 500 or more passengers occurred in or close to Canadian waters. More lives could possibly be saved by a smoothly organized building-block response. As identified above, the Team noted that contingency plans covering disasters in the maritime environment were not prepared nor available for all marine regions.

Observations

2.50 Examination of the various aspects of resourcing for SAR response raises the following observations:

Air

(a) In equipping and crewing air SAR squadrons for standby capability twenty-four hour/seven day per week/365 days per year (24/7/365), SAR squadrons generally have adequate resources to execute their primary duties for basic response.

(b) The provision of an aircraft and crew on continuous two hour standby capability for 24/7/365 requires at least three aircraft and five crews. The same number can provide a thirty minute ready standby for a normal workweek of forty hours. The number of crews needed per standby aircraft will increase if the ready time is increased to more than forty hours per week.

(c) For the purely air response role the need for a thirty minute standby versus a two hour standby is doubtful at present. This conclusion will change with the implementation of a successful ELT/SARSAT system of distress alerting and location.

(d) The primary SAR role requires a unique expertise with specially equipped, capable aircraft and efficient crews trained for their roles.

(e) Halifax Region requires fixed and rotary wing response aircraft with greater speed, endurance and range than those currently in use.

(f) All the present fixed and rotary wing SAR aircraft lack some characteristics of an ideal SAR aircraft. Specific comment is provided in this section. The next generation of SAR aircraft should be modified for their role so that they match more closely the requirements DND has defined for SAR air operations.

(g) The lack of aircraft-installed VHF/FM radios in marine SAR aircraft is a significant deficiency in executing SAR safely and effectively.

(h) Communications equipment for SAR technicians is not well designed for its role.

(i) Research and development for applying new technology to SAR requirements is neither definitive nor structured.

Marine

(j) Marine response to SAR incidents is on a 24/7/365 basis.

(k) A standby status of at most thirty minutes and preferably as short as possible is necessary in the marine world.

(l) Vessels are multi-tasked SAR vessels, given duties servicing Aids to Navigation and other CCG tasks, and in the case of DFO, fishery and scientific tasks.

(m) Public and political pressure plays a large part in the provision and location of SAR services.

(n) There are no approved levels of service or standards for the siting of SAR vessels.

(o) The public is unable to determine the emergency equipment needed to ensure survival.

(p) The capabilities and design of some SAR vessels has been questioned.

(q) The RNLI "Arun" Class and the "OMR 36", as well as the Federal Republic of Germany's "mother-daughter" boat appear to be designs worthy of consideration for use in Canada.

(r) The use of volunteers to man or partially man lifeboats was advocated by those interested parties interviewed.

(s) The number of available days for SAR vessels is reduced by prolonged refit periods.

(t) Multi-tasking of DFO vessels has declined as new SAR vessels have come into service.

(u) The full potential of the CMRA can not be appreciated because of insufficient data. However in 1980 Victoria SRR used only one-quarter the number of volunteers as compared with other regions in relation to the number of incidents.

(v) From interviews of experts at RCCs and in CCG Regions, a number of additional findings are recorded for consideration:

(1) The use of primary resources appears to take priority over the use of other response means such as CMRA or vessels of opportunity.

(2) The RCC personnel do not have an opportunity to visit their region before becoming operational.

(3) The design of the 22 metre cutters is the subject of much disagreement in the CCG.

(4) The new Grenfell 600 class is well liked by crews and is proving a successful SAR vessel.

(5) Crews would prefer higher speed vessels of the 300/400 class to minimize pounding in heavy weather.

(6) 301, 302, 303, 304 marine sub-areas require high speed small vessel response.

(7) Since the James Sinclair (DFO) will patrol 307, the George Darby should be based in Prince Rupert and patrol 305 and 306 sub-areas.

(8) Duplication by the USA and Canada of expensive resources in certain areas should be examined for the possibility of one or other organization handling a particular geographic area.

(9) The use of high speed rigid hull inflatables for the Great Lakes/Upper St. Lawrence area should be investigated.

(10) Greater use should be made of volunteers to crew vessels to assist the CCG coxswain. The replacement for the RELITE in Victoria SRR should continue to use volunteers as crew.

(11) Multi-tasking of DFO vessels has proven useful and cost-effective.

(12) The SAR course given at the Transport Canada Training Institute should be compulsory for all ships officers, coxswains and helicopter pilots.

(13) There is no national policy on towing a vessel whether in distress or not. Unfortunately, the SARSTATS do not indicate the number of tows and the mileage towed over the five year period under review. In 1980, tows occurred in 7% of the Category 3A incidents.

(14) There is no national policy on the provision of fuel to a vessel whether in distress or not. In some cases, it is provided free, in others there is a charge. In approximately 2% of all Category 3A incidents fuel was provided.

(15) When either a tow or fuel is provided free, it appears to encourage a mariner in the unseamanlike habit of deliberately staying at sea longer or venturing farther than his fuel will allow.

(16) The education of both fishermen and pleasure craft operators is the single most important factor in reducing SAR resource requirements.

Contingencies

(w) Contingency plans for rescue operations following accidents to major passenger carrying aircraft or vessels are necessary as part of the SAR organization's responsibilities. These are not prepared or available for disasters occurring in the maritime environment.

Command Co-ordination and Control

2.51 The SAR response system operates under the direction and control of six centres, four Rescue Co-ordination Centres (RCCs) and two subordinate SAR Emergency Centres (SARECs). Each SAR Region is controlled by an RCC and the SAREC's report to the pertinent RCCs for co-ordination in the marine sub-areas of the Halifax and Trenton Regions.

2.52 The Evaluation Team visited all six Canadian Co-ordination Centres and three American Centres for comparison. In Canada, in general the RCC's were found to be functional but were operating with archaic equipment and methods and rest stations for personnel on long overnight shifts were worse than spartan. All four centres were adequate in general but with equipment and information reference material fitted in wherever it would go.

2.53 The Controller's role required him to spend much of his time as a recorder of information rather than as controller of the tactical situation. Information was not presented in a manner that permitted him to concentrate on decisions. Rather, it caused him to devote much of his time to finding out facts and details and recording them. DND, with its long experience in controlling air defence and ASW tactical problems, has not brought its technology or thinking to the RCCs.

2.54 The poor facilities may well contribute to the somewhat lengthy times recorded for decision times and they certainly contribute to the often poor degree of information recorded in SARSTATS.

2.55 For comparison, the USAF AFRCC, two USCG RCCs and the Ontario Ambulance Central Dispatch Centre were inspected. These four Centres offered various improvements in allowing the controller or dispatcher to control rather than be overwhelmed by the need to search for and record information. State-of-the-art video presentations, better information access and presentation, some computer aided systems and good communications access and recording did much to enhance the controller's job. Separate rooms were provided for kitchen and rest areas complete with beds and showers in some centres. Ontario Ambulance Dispatch had a particularly effective and outwardly simple method of communication, response status tracking and co-incident management information recording. The dispatcher could handle several responses concurrently and perform the task coolly, because the necessary information was presented to him quickly and both he and the vehicle attendant could record data as they responded. Computer processing of the data was easily done to support performance measurement, levels of service and resourcing choices or changes. Three out of the four centres were modern without being excessively expensive and provided a much better impression of efficiency for the public and the controllers.

2.56 CCG SARECs were also better organized, equipped and modernized than the RCCs. Co-located with VTM and marine radio centres, they had an inescapable logic in their organization and operation as part of the systems in place to support the safety of marine transportation.

2.57 RCCs are faced with a curious anomaly. Except for Edmonton, the preponderance of activity in SAR incidents is in response to marine problems. Yet the RCC is mainly controlled and operated by DND air operations personnel, with CCG watchkeepers frequently in a subordinate role. The DND/CCG SARCORE study addresses the problem but in general recommends solutions that rectify the relationship problem without solving the fundamental one - that of a need for the marine world to run its own affairs. The question of separate RCCs to control marine SAR on a local basis, perhaps five RCCs to control events in each CCG region, and one RCC for air SAR control on a more national basis needs to be examined in depth.

2.58 An additional anomaly as viewed nationally is that DND Air Command is expected to become responsible for the overall staffing and standards of the RCC. Not to take away from Air Command's ability to improve on what was a divided system previously, but once again the emphasis in RCC work load is marine; marine cases, marine response and largely Coast Guard or other marine activity.

2.59 The problem of controlling the air response to a marine incident complicates the equation, but this can be handled a number of ways. The possibility of having a liaison marine watchkeeper at the air RCC, air liaison officers at the marine RCCs or simply by using policy directed control and communications procedures, would all require evaluation. The relative importance of the air co-ordination to marine responses is coloured by the fact that most marine incidents are responded to by surface craft.

2.60 Although the team did not visit the RCCs during their peak activity period in the summer months, it was obvious that their structure could easily be overloaded. Representatives of the air and marine public complained that if they contacted, then re-contacted the RCC, it was difficult to get the same controller. This meant that the basic information frequently had to be repeated to the RCC each time. This and other facts provided by the officers in charge of the busiest RCC (Victoria) lead to the conclusion that, for peak periods at least, sub-control centres (SARECs) or sector control within RCCs would be warranted.

2.61 The control and co-ordination problems for SAR are addressed in considerable detail in two studies, "Interim SARCORE" and the "SARCORE" study. The final study has not yet been staffed within DND or DOT. SARCORE offers many useful recommendations in remarkable detail concerning the management of RCCs and Departments should ponder them and bring those concerning the RCCs into effect expeditiously.

2.62 DND and CCG controllers appeared to have a generally good relationship for accomplishing the task except at Victoria. Here the problem of marine control and co-ordination is exacerbated by the pressures of the busiest region in the country, the most criticized by local SAR lobby groups and differing views on how to execute the task, following an experimental SAREC at Vancouver marine radio. Nationally, however, CCG Regional SAR Managers were concerned that RCCs were not using SAREC skills and resources adequately. The point at which the control of response to an incident is transferred to the RCC is a contentious issue for all SARECs, marine radio stations, VTM centres and regions. Lines of authority to an RCC are not always clear and one Regional Manager expressed the view that the RCC control of marine incidents is the weakest link in the response chain. When an RCC and a SAR Mission Co-ordinator (SMC) are located far from the scene of the marine incident it is a handicap to successful SAR response.

2.63 Overall command, co-ordination and control is displayed in Figure 1-1, Part II, Section 1. In essence, military commanders control SAR response and execute air operations but have little role in SAR prevention. As a contrast, the CCG Regional SAR manager controls both marine operations resources, execution and prevention, then hands his resources to the militarily controlled RCC to co-ordinate tasking, an RCC that may be well removed from the scene of the marine incident.

2.64 Command and control could be simplified by the creation of an RCC controlling air response and an appropriate number of separate marine RCCs. The CCG could deliver the marine SAR program, provide the resources, respond, control and co-ordinate all its operations in a unified manner. DND likewise could have a unified command, control and co-ordination of its operations resources. The need for a DND SAR Regional Commander would disappear. In its stead would evolve a Regional SAR Co-ordinator, based primarily on CCG Regions, who would ensure that all SAR operations, prevention, communication and contingency functions were planned for with assigned responsibilities.

Publications

2.65 During its investigations, the Team was unable to locate any complete policy and functional manuals to guide overall and joint SAR policy and operations. Responses from other nations such as the United States and Australia provided National SAR manuals and comprehensive assignments of duties and responsibilities. The Canadian Forces Publication A-OA-209-001/FP-001(CFP209) "Search and Rescue Orders and Procedures" provides the only general guide and it has not been brought up to date for several years. Air Command and CCG have operational procedures manuals unique to their roles. "SARCORE" identifies the need for a National SAR Manual and proposes the first chapters. Without doubt there is a definite need for an integrated series of current manuals and documents that cover the flow of SAR responsibilities from the national level to the units. These should contain policies, procedures and methods in sufficient detail for departments to conduct operations in a parallel and unified manner.

Observations

2.66 With respect to command, co-ordination and control, the Team noted that:

For RCCs

(a) facilities are out-dated, cluttered and create a poor impression of efficiency for the occupants as well as the public;

(b) state-of-the-art information access and display systems are lacking;

(c) analysis and planning of efficient work methods have not been applied;

(d) CCG SARECs are better organized and equipped than RCCs to execute their role;

(e) the organization and structure of RCCs, with their relative emphasis on air operations control, standardization and staffing, are inconsistent with the fact that demands on them are largely marine in nature;

(f) the remoteness of RCCs from the majority of the marine incidents in many sub-areas of their Region increases the response co-ordination problems and lessens their value in the eyes of marine response crews and the marine public.

Publications

(g) the SAR system lacks the appropriate current policy and joint procedures manuals to support integrated co-ordination of SAR operations among the several departments concerned.

Staffing and Training

Air Organizations

2.67 Comment on the staffing and training of air squadrons and their personnel is made on general points only. Commanding officers identified some staffing problems such as the widespread low experience levels in the Canadian Forces caused by a too rapid turnover of crews, particularly aircraft commanders. The time taken to train a pilot for full command in this very specialized and demanding operational role is lost when the pilot is posted outside SAR just as he becomes fully employable in SAR. SAR experienced supervisory officers are also difficult to get. Unit and base commanders endorsed at least two back-to-back SAR appointments to build and utilize SAR experience. In addition, one SAR squadron identified a significant shortage of SAR technicians in a unit which had to support the SAR operations of two, sometimes three squadrons.

2.68 Conversion training for SAR helicopter crews is currently conducted at individual SAR squadrons although three, and in the future four, of the Units fly the same helicopter, the CH113. A number of efforts have been made to train helicopter crews at one squadron, in effect to become the SAR rotary wing operational training squadron. All unit commanders were of the opinion that such common helicopter pilot training is necessary. It is understood that this training squadron will become operational in 1984.

2.69 Air Command is charged with the responsibility of overseeing all aspects of air SAR operations, but made it clear that it was short staffed at Headquarters to perform the role adequately. Staff positions are identified but person-years to fill them are not available.

Marine Units

2.70 There are staffing problems in the marine world also. The team was informed of some cases where personnel could not meet the high physical standard required for SAR operational conditions. It should be noted that at CCG Headquarters the SAR division is part of the Fleet Systems branch.

2.71 Ships officers have had or have the opportunity of attending courses on SAR but unfortunately with the exception of the Halifax SRR little or no training is made available for the lifeboat coxswain. The Halifax region in conjunction with the Transport Canada Training Institute has developed a training course and it appears to be successful. Training in first-aid leading to a higher level of skills would appear to be a requirement for SAR lifeboat and cutter crews.

2.72 The policy for manning RCCs produces mixed results. DND provides air operations personnel, pilots, navigators, air traffic controllers and air weapons controllers, as called for by establishments. However, where common sense would suggest that experienced SAR squadron pilots go to the RCC, this does not appear to be the case. Personnel without SAR experience and those on last tours before retirement often staff RCCs as controllers. These selections make it obvious that an RCC posting is a dead end and off the main stream for career progression. The demonstrated lack of expertise tends to make SAR units distrust the specifics of an RCCs tasking and always to take them with reservations as to operational methods. In those RCCs such as Edmonton where controllers generally came from local SAR roles, there was a closer relationship with crews and confidence in the RCC appeared much higher.

2.73 The CCG requirements for RCC employment call for ships officers with qualifications and experience on CCG vessels, but not necessarily a SAR background. The level of public service rank given to the watchkeeper's position tends to forestall movement through the position because of the limited number of billets the controller can go to next. Once again there is considerable merit in selecting personnel from a marine SAR background for employment in an RCC. A possible structure might be an RM SAR having the resources of SAR ships officers, SAR vessels and the RCC watchkeepers and also responsible for a marine RCC, which would perhaps allow him to move personnel readily from one role to the other with the attendant advantages.

2.74 Search Mission Co-ordinators (SMCs), searchmasters and RCC controllers learn their craft at four locations: the U.S. National SAR School at Governor's Island, New York, operated by the USCG, Transport Canada's Training Institute (TCTI) at Cornwall, Air Transport Group's Operational Training Squadron at Trenton and on the SAR units. The Evaluation Team observed that there was consistency in training potential SMCs in the air or marine world within their specific environments but insufficient crosstraining or training of an air SMC/Searchmaster for the marine environment. Air RCC controllers, who frequently come from non-SAR backgrounds, were not required to have other than on-job training to begin their duties. There is considerable merit, in view of the marine emphasis of the SAR response problem, in ensuring that all SMCs be trained and qualified for their role and that this training be conducted by one organization. Within RCCs, Coast Guard Watchkeepers and air operations controllers often had to handle one another's type of search and rescue response because of the numbers of cases. Mutual training would appear to be well warranted and qualification training should be obligatory before individuals begin controller duties.

Observations

2.75 For response, co-ordination and controlling duties, observations on staffing and training are:

(a) Air units report a lack of experienced aircraft commanders and supervisory officers as a result of a too rapid turnover. One unit, at least, is significantly short of SAR technicians.

(b) Air operations personnel generally, rather than SAR experienced pilots and navigators in particular, are selected for RCC controller duties.

(c) Air Command has insufficient person-year resources to man Headquarters SAR staff positions.

(d) A single operational training squadron to provide common SAR helicopter conversion appears to have advantages in view of the number of individual units now providing similar training.

(e) The CCG fills watchkeeper positions with ships officers who do not necessarily have SAR experience.

(f) Departments usually train marine search mission co-ordinators and searchmasters separately although individuals from either DND or CCG may control or co-ordinate marine searches at RCCs.

(g) RCC controllers are insufficiently trained to begin their duties, particularly when air operations officers may be required by circumstance to co-ordinate marine SAR response.

(h) Instances of poor manning practices for SAR vessels have occurred.

(i) CCG coxswain training is not yet provided to all personnel manning coxswain positions.

(j) A higher level of first aid training is needed for CCG SAR lifeboat and cutter crews.

Aiding

Overview

2.76 Once the search object has been located, attention turns to providing aid to the survivors. To save lives at risk is the prime goal of the SAR response system. This is the Rescue function of Search and Rescue and brings the rescuer a new set of problems distinct from the alerting and responding processes that have preceded. Aid is provided to the survivors of air distresses and/or survivors and vessels in marine distresses. Means and equipment to handle the problems may be different in the air and marine environments. The value of helicopters becomes especially apparent because of their capabilities, although they are also the most expensive resource to operate. In selecting response resources, rescue co-ordinators must consider the most economical method of providing aid in addition to its capability.

2.77 A major aspect of rescue strategy is that when it locates the search object, the response craft must be sufficiently capable or equipped to provide aid to the extent necessary. For example, a fixed wing rescue aircraft without means of landing or otherwise delivering aid to a remote site or a vessel in difficulty, is unable to complete its mission. A Coast Guard IRB responding to assist a medium size vessel in trouble will not be able to offer much in towing or medical aid. Consequently, SAR authorities and controllers usually ensure that the responding aircraft or boats have more rather than less equipment to do their job. This enhances the chances of survival for the victims by shortening the time necessary to get aid on scene. Tasking a search resource, then following it with a rescue resource is avoided where possible if the two capabilities can be provided in one response craft.

2.78 Rescue equipment and training in rescue procedures is specialized to ensure safety both for the victims and the rescuers. This is particularly true in the air world and results in rescue being provided primarily by aircraft and crews specially trained and current in the role. This continues to be an overriding factor in air response to SAR. Dedicated units with training, standards, equipment and currency are vital to safe SAR operations and these cannot be done consistently and safely by amateurs. Only some aspects of the SAR time line activities can be performed by non-professionals, i.e. some searching and easy rescues, and only under favourable circumstances.

2.79 Although extra equipment is needed in the marine world to fully outfit a rescue vessel, many rescues can be accomplished by boats normally equipped. Relative size and capability of vessels is important, but a vessel is conventionally more likely to have first aid, tow equipment, etc. as part of its normal gear. This fact allows it to be routinely able to render aid. While this situation is less true of pleasure craft, even they can provide some assistance to other pleasure craft. While important, the aiding problem is less demanding in the marine world in many respects, as long as aid of some kind is available. This statement is only expressed for ranking the two regimes for resourcing and in judging the need for specialized rescue capabilities. Obviously, under difficult conditions, marine rescue is a specialized challenge although its skills are more part of the skills of good, capable seamanship than those which must be emphasized by the demands of a specialized rescue role.

2.80 Because aid to survivors is the main goal of SAR, the ability to provide reassurance and medical assistance to the victims is important. As previously mentioned, the survivors of an air accident may be suffering significant physical trauma which requires specialized medical skills to handle. In addition, specialized abilities may be necessary to get medically-capable people to the accident scene. The marine world rescuers may face some injury treatment problems just as difficult, but proportionately it is far less likely. Therefore, the air and marine worlds expect rescuers to have a different level of capability and training.

Aiding - Air

2.81 Deploying. Assistance is provided by specially trained SAR technicians who are capable of being deployed by many means. These specialists can parachute, rappel, arrive by helicopter hoist or walk in to a scene. They are capable of bush work, mountain climbing, wilderness survival and, to a limited extent, underwater diving. All are trained at the Canadian Forces Survival Training School to an uncompromising standard that produces an able rescuer.

2.82 The SAR response aircraft are capable of delivering the SAR technicians safely by most means available - parachuting, STOL landing and by helicopter landing or hoisting.

2.83 In interviewing members of every DND SAR unit in Canada, the Team found that this aspect of SAR was well done. There was no evidence of other than complete support and accomplishment in training, equipment and manning except in one instance. All units complained of the lack of aircraft-installed VHF/FM equipment for marine rescues. A portable radio had been available in SAR aircraft for about two years and it had proven unsatisfactory in use. Although the Buffalo Avionics Update program and SARCUP for the Voyageur Helicopters will rectify the problem, units did not have this perspective and considered they had been poorly equipped for communicating in the marine rescue role. In some instances, crews will be forced to use the portable units for up to five years. SARCUP will improve most of the other SAR helicopter rescue deficiencies mentioned to the Team. Other routine deficiencies appear to be correctable within DND's normal improvement processes and are well identified within the departmental system.

2.84 Assisting. On scene, SAR technicians administer medical assistance as trained and equipped paramedics. Their skills are closely monitored by Service medical officers and Air Command and Unit standards. One strongly expressed view was that the SAR technicians' medical capabilities and training should be even further developed. Other than to commend the professionalism, morale and abilities of this group of specialists, the Team has no further comment.

2.85 Evacuating. Survivors of air distresses are likely to be hoisted from an accident scene by helicopter, flown out if a fixed wing aircraft can land near by, or taken out by a ground party by whatever transportation is appropriate. Aircraft must be capable of holding stretchers and roomy enough for victims and/or rescuers to move about inside, since further life-sustaining aid is possible in all SAR aircraft. Medical evacuations (H1-H5), which in most cases are patient transfers, require the same aircraft capabilities except that additional specialized medical support equipment may be needed. No difficulties in terms of availability of aircraft, compatible electric power sources or the like were identified. Specialized portable equipment is normally supplied by service or civilian hospitals and the SAR unit is concerned primarily that it is verified safe for aircraft use.

2.86 The knowledge of where survivors should be taken appeared to be well developed in RCC's and Units. Helicopter Units have training programs that allow them to fly to hospital helipads for familiarization before having to use them operationally for the first time in difficult weather. One Unit identified difficulty in obtaining standing overflight clearances for training flights to St. Pierre and Miquelon, despite the need to service these French Islands for actual emergency medical evacuation.

Observations

2.87 For SAR aiding in the air context, it is noted that:

(a) the activity is well supported with personnel, training, equipment and capability within practical limits;

(b) DND SAR Squadrons are inadequately equipped with VHF/FM radios for communicating in marine rescues. The time gap between interim use of portable radios and aircraft installed radios is unnecessarily long.

(c) Overflight clearances for SAR training flights to St. Pierre and Miquelon need to be readily granted.

Aiding - Marine

2.88 Assisting. This task is primarily the aiding of vessels by towing or the supply of pumps or other mechanical aid. There is no Cabinet policy for towing or the provision of emergency fuel. However, towing is performed under the ICSAR approved objective, "to minimize damage to or loss of property", without charge for either the tow or, in some cases, without payment for the fuel. CCG SAR crews are well trained and equipped to perform their missions, the only limitation being the performance capability of some of their vessels.

2.89 There are no criteria for the provision of medical aid to rescued persons, or the necessity for each SAR vessel to have a para-medical crewman on board. It should also be noted that as far as can be determined, there have been no complaints from the public about this. It would appear that advanced St. John's Ambulance first aid training along with a hypothermia suit and oxygen may well suffice.

2.90 Evacuating. Medium distance and offshore craft must be able to accommodate the rescued and more especially stretcher cases. As mentioned previously the design of new SAR vessels has not taken this need into account.

2.91 A large number of those interviewed said that dedicated SAR vehicles should be clearly identified so that they may be distinguished from all other vessels especially other CCG vessels. It was also stated that the superstructure of SAR vehicles should be of a different colour, preferably orange, so that the vehicle stands out in breaking seas. The Team has noted that this recommendation was made by Cabinet in 1977. The use of colour and of the words "Rescue" and "Sauvetage" on dedicated SAR vehicles would tend to eliminate questions as to why the CCG helicopters and other non-SAR CCG vessels do not necessarily respond to a SAR problem.

Observations

2.92 For marine SAR aiding, it is noted that:

(a) CCG SAR crews are well trained and equipped to perform their missions.

(b) There is no official government policy on the towing of vessels or the supply of emergency fuel.

(c) There appears to be no need for fully qualified paramedical crewmen on CCG/DFO SAR vessels but a higher level of first aid training is necessary.

(d) The nature of the marine environment calls for the use of immersion suits to protect survivors from hypothermia.

(e) There is a need for the SAR clientele to identify those vehicles which are dedicated to SAR.

SECTION 3 - LEVEL OF SERVICE STANDARDS AND GOALS

General

3.1 The system which provides SAR life saving services may be structured in a number of ways, from a minimum level of rescue craft to a very expensive rescue fleet which removes any incentive for self-help from the air and marine operating public. If demands for SAR service are allowed unlimited pressure on government resources, unneeded response vessels and aircraft may be acquired and positioned that provide too much or too little service for either policy or need. In relation to the need, the federal government has no policy as to the level of service it expects. This section proposes a method of approaching the problem.

3.2 Sections 1 and 2 of this Part describe in logical sequence the reasons for SAR operations and how they are conducted, from the stated purpose of a SAR system, to a study and definition of the survival problem faced by the air and marine public following a distress incident. There follows then a definition of the structure, composition and resourcing of a response system to rescue those in need of aid within the time span of survival. All this survival process is tied together illustratively by the SAR Time Line in Part III Figure 1-3. Assuming that the government will provide this SAR service or see that it is provided, policy must be promulgated on how much equipment and how many crews will be made available. To determine this policy, a level of service must be defined, goals and standards derived and stated. Once this is done the number and location of SAR resources can be determined and alternative methods of delivering the program assessed. The relative roles of resources supplied by government at all levels and of volunteers can then be evaluated. This process will be amplified in this Section and provide targets for goals and standards.

Purpose of SAR Operations

3.3 The primary reason for SAR resources is to save lives at risk. In the air world the focus is mainly on human survivors whereas in the marine world, in the process of saving people, vessels are usually assisted also. Peoples' lives are saved not only by specialized government response craft but in many instances by another vessel or aircraft that happens to be in the vicinity. Much emphasis is placed on improving government SAR resources but another option is to identify and use vessels of opportunity and increase their capability to assist. Goals and standards should be developed with both resources in mind so that a balanced selection can be made from the alternate means of providing a SAR service.

Assumptions

3.4 To structure a series of goals for SAR operations and determine the applicable levels of service, there must be assumptions about the potential clientele and the approach to providing response resources.

3.5 Air and marine craft operators have a responsibility to take measures to improve their chances of survival and a government SAR system should be based on such an assumption. This is axiomatic to the setting of standards. Operators may be either ignorant, careless or negligent of the need to prepare for survival. Environmental conditions in Canada do not permit an operator the luxury of disregarding all self-assistance and relying on someone else, that is, the government to leap to his assistance. Prevention measures should initially address this problem. The first assumptions are therefore that, with regulations and guidance from the government, aircraft and boat operators will equip themselves to survive for a minimum period of time on land or in the water. They will also equip themselves to assist their being found. Definition of the pertinent survival time is a major constituent for determining the level of service.

3.6 The second series of assumptions relates to the levels of response service. As outlined early in this report, the rate of distress occurrences is directly proportional to the air and water navigational traffic in any area. Aircraft and boats that travel farther from well-travelled routes must be better equipped for survival because SAR resources will probably take longer to know of and reach the scene of any distress. Remote areas of the country have far fewer distresses because the traffic is less and the rate of exposure to potential difficulties is lower. As a consequence of the better survival capability, the level of service to these areas can be less stringently defined. Accordingly, service level objectives and capability of government SAR resources can be developed and modified.

3.7 Differing levels of service by geographical area are particularly appropriate to marine SAR. These service levels can be further modified according to the declared degree of urgency when the SAR system is alerted. Within the requirements of air SAR, the method of learning of a distress is a major determinant of a service level. A "May Day" call by an aircraft, accompanied by a broadcast of its intentions and co-ordinates to pinpoint its distress site, should trigger an immediate response. A missing aircraft learned of by an overdue flight plan, will probably produce a more measured response because of the lack of detail and the associated verification. Levels of service will be defined in accordance with these differences.

Objectives, Standards and Goals

3.8 Objectives, standards and goals may be defined within the structure proposed above, which includes specific assumptions for survivability and levels of response adjusted to the traffic levels of an area. Table 3-1 provides a summary of a method of evolving a series of standards and goals for the Canadian SAR system. The goals suggested provide a starting point of review. Within the present context of SAR, a number of the stated goals would be difficult to achieve. With an organized approach such as this, however, operations experts can deliberate and produce a similar and attainable output. Policy and the resulting number of SAR resources can then be determined, based on a more systematic approach than exists at present.

TABLE 3-1

STANDARDS OF SERVICE-SAR SYSTEM OPERATIONS

ITEM	ASSUMPTIONS	LEVEL OF SERVICE		MEANS OF DELIVERING
		OBJECTIVES	STANDARDS OR GOALS	
1. Purpose (a) To save lives at risk in air and marine distresses.	(1) System cannot save lives of those who succumb before the SAR system is notified except in the event of help by craft of opportunity.	(1) To save all lives possible of persons experiencing an air or marine distress. (2) To improve life saving capability of craft of opportunity.	Maximize ratio of lives saved (after SAR system notified) $= \frac{\text{Lives Saved}}{\text{Persons Involved}} \leq 1.0$	Federal SAR resources Volunteers Others Enhanced radio monitoring and aid capabilities of all craft.
2. Survival (a) Marine	By three types of marine traffic areas (1) Normal — vessel operator carries sufficient survival gear for expected environmental conditions in all maritime areas for all occupants.	(1) To survive in water in expected environmental conditions.	(1) Survival at least two hours	— Federal government prepare and maintain approved criteria and lists of minimum required survival equipment to be carried for normal, peak, offshore and remote traffic areas.
	(2) Peak — Recreational boater at high season will carry floatation gear only for designated areas.	(2) To survive in water in expected Jun-Sep water temperatures.	(2) Survive at least one hour	
	(3) Off Shore Waters and Remote Areas-vessel operator must be equipped to survive out of water.	(3) To survive out of water	(3) Survive in lifeboat/raft or on land at least 48 hours	
(b) Air	(1) Occupants will support own survival by carrying sufficient gear for severe environmental conditions.	(1) To be self supporting and to be able to care for minor injuries in surface environmental conditions travelled over by flight.	(1) Survive at least 48 hours	— Regulate, educate and enforce compliance with standards

TABLE 3-1 (Con't)
STANDARDS OF SERVICE-SAR SYSTEM OPERATIONS

ITEM	ASSUMPTIONS	LEVEL OF SERVICE		MEANS OF DELIVERING
		OBJECTIVES	STANDARDS OR GOALS	
3. Operations Activities (a) Alerting-Marine (T0-T3)	(1) Vessel Operator — Has radio and/or visual alerting location devices. — Uses voyage plan when trip takes him beyond reliable radio or visual contact of a responsible monitoring agency.	(1) To minimize time for alerting system or nearby vessel to learn of a distress.	(1) Normal and offshore-SAR system or vessel of oppo-tunity to learn of distress within 30 minutes of its occurrence or within one hour of overdue in 95% of the cases. Peak-SAR system or vessel of opportunity to learn of distress within 15 minutes in 95% of the cases.	— Marine radio systems — Emergency frequencies — Monitoring of emergency frequencies — VHF/DF systems — Voyage plan — Visual and electronic alerting devices
	(2) Vessel Operator does not use recommended or required systems.	(2) To initiate a SAR response when the system finally learns of a distress.	(2) SAR system or other agency to coordinate a response when able.	
(b) Alerting-Air	(1) Aircraft Operator has: — radio and visual alerting and location devices — ELT — utilitizes flight planning system	(1) To minimize time for alerting system or other aircraft to learn of distress.	(1) SAR system or other responsible agency to learn of a distress or an overdue within one hour of its occurrence or specified SAR time in 95% of the cases.	— FSS and ATS communication services — Monitoring of emergency frequencies — VHF/DF systems — Flight plan system — ELTs and visual alerting devices
	(2) Aircraft Operator does not use flight planning system.	(2) To initiate a SAR response which system learns of a distress.	(2) SAR system or other agency to coordinate a response when able.	
(c) Responding-Marine (T4-T8)	(1a) Response service will change as potential for occurrence decreases and as potential client vessels increase in size and survival self help capability (offshore vessels with life-boats). Specific marine rescue areas will be designated such as: — inshore waters-moderate to heavy traffic — light traffic — offshore waters	(1) For designated moderate to heavy traffic inshore waters and the Great Lakes — to provide adequate SAR response resources for survivors of marine distress	(1) Normal—To execute the SAR system response time activities for survivors within two hours of occurrence for 90% of the cases. Peak—To execute the SAR system response time activities for survivors within 30 minutes in 95% of the cases.	CCG DFO Volunteers Vessels of Opportunity
	(1b) Response service will react to any distress but will give priority to known distresses that have used the alerting system correctly over those who are simply "overdue" or "missing" having neglected to employ any measures for helping the system to help them.	(2) For other (light traffic) inshore waters — to provide adequate SAR response resources for survivors of marine distresses	(2) To execute SAR system response time activities for survivors within 4-24 hours in 90% of the cases.	
		(3) For Offshore Waters — to provide SAR response resources to sustain survivors until vessels of opportunity can be redirected to the location of the distress.	(3) To provide by air or surface vessel delivery methods sufficient survival equipment to sustain life for 24 hours for up to 50 people. To have in place the means to locate, redirect and get on scene the most appropriate assistance vessel within 12 hours of the occurrence in 95% of distresses.	DND CCG/DFO Procedures for determining the whereabouts and capabilities of all offshore vessels
(d) Responding-Air	(1) Efficiency of response service will function in direct proportion to the correct use of ELTs, flight planning and flight conduct procedures and of methods to enhance the efficacy of visual searching.	(1) To provide rapid response to assist survivors of an air distress whose location and time of incident occurrence are specifically known.	(1) To execute SAR system response time activities for survivors within 4 hours of occurrence for 90% of cases.	DND Volunteers Company Self-Help
		(2) To conduct an effective fast search of the probable track of a missing aircraft to locate cooperating survivors quickly.	(2) To complete an electronic and 1500/feet/3 mile visual search of the probable track and its vicinity within 24 hours for 90% of the cases.	Others
		(3) To conduct a search of the primary probability area for location of a missing aircraft.	(3) To complete a visual and electronic search of the 80% probability area at 1500 feet/3 mile within 48 hours for 90% of the cases.	
(e) Aiding-Air (T4-T10)	(1) Rescue personnel are specially trained and equipped to get to distress site and administer adequate medical aid to survivors.	(1) } To provide sufficient aid to (2) } take survivors to safe haven. To provide adequate medical help to sustain life until survivors reach medical facilities.	(1) } Aid all survivors of distresses. (2) } Maximize the saving of lives.	DND — Aircraft — SAR technicians CCG — Vessels — First Aiders Others
(f) Aiding-Marine	(2) Rescue personnel and vessels are equipped and trained for adequate aid of 'client' vessels.			
4. Contingencies	That it is probable that a major air or marine passenger carrier or offshore oil rig distress or disaster will occur within or close to Canadian areas or responsibility for SAR response and aiding.	(1) To respond to and rescue the survivors of a major air, marine or oil rig disaster from the remote areas of Canadian SRRs.	(1) To locate, provide protection from severe environmental conditions, provide life-sustaining medical aid, and evacuate to urban medical facilities or safe haven up to: (a) Marine-500 people (b) Air-200 people (c) Oil Rig-100 people	RCC CCG/DFO DND HWC Emergency Measures Police Municipal Ambulance & Hospitals Volunteers Companies
		(2) To cooperate with and assist US or Danish (Greenland) authorities in responding to air or marine disasters in adjacent land or water areas.	(2) To have in place the command, control coordination and response structure with resources identified to accomplish a successful rescue of the survivors of the disaster.	Contingency Plans Training Resources Use of existing SAR structure

3.9 In order to achieve the goals, specific standards for operations must be determined. The Time Line provides a logical way of assessing where standards are needed and practical. Standards for standby status are well known but other standards can now be built into many of the significant Time Line activities. With standards and numerical goals, performance measurement is also possible.

Resourcing

3.10 Building on the foundation of a declared policy for SAR service, with objectives, goals and standards, SAR operations can be resourced with government-provided ships and aircraft, and volunteer groups. As well, alternative resources can be evaluated.

3.11 Here is an example to illustrate a further development from the suggested goals for air response in Table 3-1. After relating the rapid response goal to a level of service, an additional goal could be suggested for positioning air resources. A stated resourcing goal could be to position primary fixed wing SAR resources so they could reach 80% of the distresses in a SRR within 4 hours. Planners could take this goal along with others and easily calculate the air resources needed. Similar levels of service could be defined for rotary wing and marine response. A usefully programmed management information system could report on the achievement of a goal and provide a continuing measure of the system's effectiveness.

Goal Achievement

3.12 Neither the air nor marine SAR system achieves these goals now. The air system is not far from meeting the goals but for two reasons: one, the average lengthy notification times and two, the effectiveness of visual search methods. Once again, a reliable ELT/SARSAT system offers the chance to correct both shortfalls. More primary SAR aircraft are an unlikely alternate solution and this evaluation has made no analysis to suggest this as a solution.

3.13 Resourcing alternatives for the marine world are addressed in Section 4.

Observations

3.14 This discussion of levels of service goals for SAR Operations and the Program indicates the following:

(a) There is no policy as to required levels of service standards and goals for the Canadian SRRs.

(b) Objectives, goals and standards for levels of service would provide valuable guidance for developing resource needs for the SAR program.

(c) Goals and standards would show the public the exact degree of self-help necessary for their own survival within the SAR system's rescue capabilities.

(d) Such goals would also provide the basis for a system of performance measurement to help judge the success of the Program and to make the best use of operations activities.

(e) Table 3-1 suggests the nature of objectives, standards and goals which would define levels of service for the National SAR Program.

(f) A more specific evaluation of SAR Operations activities is difficult without defined government policy, goals and standards in place.

SECTION 4 - SAR RESOURCE ALLOCATION

Alternatives

4.1 Once goals, standards and levels of service are established, analysis of the various methods of delivering SAR operations activities becomes systematic and measurable. These alternatives then provide choices and options which can be evaluated and selected for the most desirable SAR Program. Criteria must be developed against which to test the options and some of these appear in the "Assumptions" and "Standards and Goals" columns of Table 3-1, Section 3. Social, economic and other criteria may also be added against which to compare the options.

4.2 Two approaches are illustrated in this Section: one, an analysis of three ways of delivering the marine SAR operations program; and two, a basic planning model for operations research into SAR resource allocation.

Alternatives: Marine SAR Operations Program

Scenarios

4.3 As in the Lang/Stright study of the Victoria SRR, marine sub-areas were examined across the country for physical and environmental conditions and incident occurrence. In determining the mix of resources, the speed of the response and the vehicle capability and availability (response days) were identified. From this data, including SARSTATS records for 1976 - 1980, three methods of delivering the marine operations program were compared for levels of service and the costs of providing that service.

4.4 The three scenarios to be compared are listed below according to the level of service goals that defines each approach:

(a) Scenario I - to have a federal SAR response within 2-4 hours at an incident within a 50 mile radius of a SAR response base. The number of incidents (level of SAR events) was also an important criterion.

(b) Scenario II - to have a federal SAR response in only those areas where lack of population or geographic or environmental conditions make a federal service necessary. The corollary of this situation is to use volunteers to their maximum availability.

(c) Scenario III - to have a federal SAR response as defined by the 1982/1983 National SAR Plan.

Response Vessels

4.5 In addition to the existing kinds of CCG SAR vessels, additional types of rescue vessels are used in the scenarios and positioned in certain sub-areas. These are utilized on the principle that, as one alternative worthy of testing, Federal SAR response can be provided by a different type of response vessel. The Team's intention is not to specify such vessels, but to use them only as examples to illustrate the improved performance characteristics required for specific sub-areas. Table 4-1 displays the performance characteristics of CCG SAR vessels and adds those of the additional vessels, the "OMR 36", the "Whaler" and the "Atlantic".

Scenario Description

4.6 The criteria used for the selection of SAR vehicles in Scenario I are based on the required performance capability of each type of vessel and are;

Distant waters - class 600
Offshore - class 400/500
Inshore and sheltered waters - class 300 - OMR 36
Sheltered waters - Whaler/Atlantic

The Team considered that, to achieve mission success, the following criteria must be adopted.

(1) for the casualty - the early arrival of a lifeboat can be a matter of life and death; and

(2) for the lifeboat's crew - a quick passage to minimize their exposure so that they will be less fatigued.

4.7 In all the scenarios, the placement of the Inshore Rescue Boats (IRB's) is not discussed. The detail of each scenario is shown in the following paragraphs. Table 4-2 describes the suggested vessel distribution by marine sub-area for each scenario. Table 4-3 provides a summary of the number of vessels required for each scenario.

4.8 Scenario I

(a) Halifax SRR. The scenario suggests that there should be four 600 class vesels of the Grenfell type. The timings of the patrols within the various sub-areas would be arranged to ensure no duplication of coverage. The main response from lifeboat stations would be a 400/500 class vessel together with OMR 36s for closer inshore use. The use of DFO multi-tasked vessels would be increased and the CMRA strengthened, especially in the mainland areas. No additional or redeployed air resources would be required. An agreement with USCG should be made to ensure non-duplicate coverage of areas 006 and 007.

(b) Trenton SRR. The scenario suggests that the use of Whalers/ Atlantic and OMR 36s with one 400/500 class stationed at Tobermory to cover sub-areas 102, 103, 104 in extreme weather, would provide the coverage required. The Team was pleased to note the agreement

TABLE 4-1

SEARCH AND RESCUE VESSELS (1982/83 SAR PLAN)

CLASS	TYPE	CRUISING SPEED	APPROXIMATE RANGE NAUTICAL MILES	NO. OF (7/24) OPERATIONAL DAYS PER YEAR	CREW/NO. OF CREWS
600	OSV	13	2,000	365*	16 / 2
500	Intermediate	14	750	196	16 / 2
400	Small Cutter	18	500	365*	6 or 12 / 2
350	Hovercraft	45	200	365*	3 / 3
310	Ocean Lifeboat				
305	Improved 300 Class	14	65		
300	Self-Righting Lifeboats	11	50	365*	4 / 2
200	Small Ice-Strengthened Tug				
100	Rescue Launch	20	50	365*	3 / 2
INSHORE RESCUE BOATS		20	25	100	3 / 2

N.B. Approx. Range Nautical Miles will fluctuate depending on the CSI Certificate of the rescue unit and the certification of the Master.

Approx. refit period is 35 days.

SUGGESTED VESSEL TYPES

305	OMR 36 Rigid Hull Inflatable	29	80	365*	3 / 2
100	Whaler	30+	50	365*	2 / 2
100	Atlantic Rigid Hull Inflatable	30	50	365*	2 / 2

made with the Niagara Regional Police to man a SAR provided vehicle on a round-the-clock basis. This trend-setting agreement should improve the co-operation of provincial, regional, municipal and harbour police forces in this area.

(c) Victoria SRR. Within this region, the scenario suggests that area 301 and part of 302 and 303 should, by agreement, become the responsibility of the USCG for air coverage and foul weather marine coverage. The southern end of the Alaska panhandle area 531 should be the responsibility of the Canadian SAR organization, with helicopter coverage from the Masset area and maritime coverage by the 600 class George Darby and the 400/500 class vessel at Prince Rupert. The DFO vessels to be stationed at Masset and Queen Charlotte City would be multi-tasked to SAR. The patrols of the Darby and the Sinclair, a DFO multi-tasked vessel, would be programmed to avoid simultaneous coverage of an area. Additional multi-tasked DFO vessels will be used in sub-areas 305 and 307. In the critical sub-areas of 301-304, the main marine response would be by Whalers/Atlantic supported by the hovercraft and with OMR 36s in the northern part of 304 and covering the southern portion of 305. The use of volunteers in the 301-304 sub areas would be encouraged perhaps through the manning of the whalers during the peak week-end period. It should be noted that the Lang/Stright team in its detailed and excellent report on the Victoria SRR suggested that a helicopter detachment at Masset would not be viable. The Team considers however that if, as suggested above, the Canadian SRR organization covers the southern part of sub-area 531, a helicopter detachment at Masset may be a viable operation.

4.9 Scenario II

(a) Halifax SRR. This scenario suggests that only the 600 class patrol vessels and the near offshore 400/500 class would be utilised. The two small icebreaking tugs in 032 sub-area would be continued. The CMRA would be the only other marine resource available. All other vessels including DFOs would be vessels of opportunity only. Where possible, all 400/500 class would be coxed by SAR personnel and manned by volunteers.

(b) Trenton SRR. The only major vessel in the Trenton region would be the 400/500 class at Tobermory. Some of the OMR 36s would be coxed by SAR personnel and manned on a volunteer basis. Much of the responsibility in this region would belong to the CMRA or other organizations.

(c) Victoria SRR. In this region, 301-304 would be handled by a volunteer organization with the exception of the hovercraft. The SAR organization could make an outright gift of the Whaler/Atlantic to the volunteer organization or the group could be responsible for the manning only with maintenance performed by a coxswain/mechanic. In the other areas, the 600 class patrol vessel would cover 305/6/7. The 400/500 class would be coxed by SAR personnel and manned by volunteers where possible.

4.10 Scenario III. This lists the vessel distribution as summarized in the CCG portion of the 1982/83 National SAR Plan.

4.11 The projected SAR fleet as shown in Scenario III does not make sufficient use of high speed vessels to meet these response criteria. The experience of the SAR organizations of some other nations has shown that up to 50% of all incidents can be handled by inflatable rescue boats or by Rigid Hull inflatables.

4.12 Of the national total of marine incidents 39% occur in the Gulf Islands/Straits of Georgia sub-areas 302-304. It is in those mainly sheltered waters that the public makes many of the criticisms about slow response to marine distress. In Scenario I and Scenario III the following vehicles are utilized:

Scenario I	Scenario III
2 - OMR 36	1 - 400 class
2 - Hovercraft	3 - Hovercraft
7 - Whalers/Atlantic	3 - 100 class

4.13 The response time to an incident will be considerably faster with Scenario I than Scenario III. In addition, the use of suitably trained volunteers to man some of the SAR vehicles under the supervision of a CCG coxswain-mechanic would give the population a sense of participation in this vital role.

Scenario Costing

4.14 Scenarios have been costed by using unit resource data, as supplied by departments and other sources, inflating values to 1982/83 dollars, and filling in the costs where resources were specified in the scenarios.

4.15 A variety of methods were necessary: CCG and DFO costs are calculated by each vessel; CMRA costs are based on a per incident calculation; and DND costs are based on O&M costs per squadron. Costs and resources not included by this method appear as "other costs". An example would be Headquarters staff. Other costs appear only in the cases of CCG and DND.

4.16 Since the most variable item in the scenarios is CCG vessels, capital for these vessels is depreciated on a straight-line current replacement cost basis, in order to approximate a per annum cost. No depreciation appears for DFO vessels whose primary purpose is non-SAR, or for CMRA vessels whose depreciation is not costed to the SAR program.

TABLE 4-2

SUGGESTED VESSEL DISTRIBUTION

HALIFAX SRR

SUB-AREA NAME	1976-1980 INCIDENTS		SCENARIOS		
	DISTRESS	OTHER	I	II	III
001 Saguenay	8	63	1. OMR 36 2. CMRA 3. QPP 4. Air-Trenton	CMRA Air-Trenton	400 Tadoussac 500 Patrol CMRA Air-Trenton
002 Anticosti	7	63	1. Δ600 Class 2. Multi-Task DFO 3. CMRA 4. QPP 5. Air-Summerside Gander	Δ600 Class Patrol CMRA Air-Summerside	300 Gaspé 300 Harrington H Multi-Task DFO CMRA Air-Summerside
004 P.E.I.	39	985	1. 400/500 Magdalen 2. OMR 36 Souris 3. Multi-Task DFO 4. CMRA 5. Air-Summerside	400/500 Magdalen (Vol) CMRA Air-Summerside	305 Magdalen 310 Souris 305 Shippegan Multi-Task DFO CMRA Air-Summerside
005 C. Breton	14	283	1. *600 Class 2. 400/500 Louisburg 3. Multi-Task DFO 4. CMRA 5. Air-Summerside	*600 Class Patrol 400/500 Louisburg (Vol) CMRA Air-Summerside	1 Patrol(1) 600 310 Louisburg 300 St. Lawrence Multi-Task DFO CMRA Air-Summerside
006 Fundy	7	355	1. 400/500 Westport 2. Multi-Task DFO 3. CMRA 4. Air-Summerside	400/500 Westport CMRA Air-Summerside	310 Westport Multi-Task DFO CMRA Air-Summerside
007 Georges	34	1,685	1. *600 Class Patrol 2. 400/500 Clarks Harbour 3. 400/500 Sambro 4. Multi-Task DFO 5. CMRA 6. Air-Summerside	*600 Class Patrol 400/500 Clarks Harbour (Vol) 400/500 Sambro (Vol) CMRA Air-Summerside	Patrol (2) 600 310 Clarks Harbour 310 Sambro 300 Port Mouton CMRA Air-Summerside
008 Fisherman's	25	517	1. *600 Class Patrol 2. 400/500 Fisherman's Harbour 3. Multi-Task DFO 4. CMRA 5. Air-Summerside	*600 Class Patrol 400/500 Fisherman's Harbour (Vol) CMRA Air-Summerside	Patrol (2) 600 310 Fisherman's Harbour Multi-Task DFO CMRA Air-Summerside

TABLE 4-2 Cont

SUB-AREA NAME	1976-1980 INCIDENTS		SCENARIOS		
	DISTRESS	OTHER	I	II	III
009 Labrador	7	29	1. CMRA 2. Air-Summerside, Gander	CMRA Air-Summerside, Gander	CMRA Air-Summerside
010 Baffin	-	2	1. Air-Summerside	Air-Summerside	Air-Summerside
011 Banks	35	142	1. +600 Class Patrol 2. Multi-Task DFO 3. CMRA 4. Air-Summerside, Gander	+600 Class Patrol CMRA Air-Summerside, Gander	+600 Class Patrol CMRA Air-Summerside, Gander
031 Corner Brook	16	80	1. o600 Class Patrol 2. OMR 36 3. Multi-Task DFO 4. CMRA 5. Air-Summerside, Gander	o600 Class Patrol CMRA Air-Summerside, Gander	o600 Class Patrol 310 Daniels Hrbr Multi-Task DFO CMRA Air-Summerside, Gander
032 Notre Dame	27	202	1. +600 Class Patrol 2. 200 St. Anthony's & Twillingate 3. Multi-Task DFO 4. CMRA 5. Air-Summerside, Gander	+600 Class Patrol 200 St. Anthony's & Twillingate (Vol) CMRA Air-Summerside, Gander	+600 Class Patrol 200 St. Anthony & Twillingate Multi-Task DFO CMRA Air-Summerside, Gander
033 Conception	17	154	1. +600 Class Patrol 2. OMR 36 Conception Bay 3. Multi-Task DFO 4. CMRA 5. Air-Summerside, Gander	+600 Class Patrol CMRA Air-Summerside, Gander	+600 Class Patrol 400 Class Multi-Task DFO CMRA Air-Summerside, Gander
034 Burin	17	297	1. o600 Class Patrol 2. 400/500 Burgeo 3. 400/500 Burin 4. Multi-Task DFO 5. CMRA 6. Air-Summerside, Gander	o600 Class Patrol 400/500 Burgeo (Vol) 400/500 Burin (Vol) CMRA Air-Gander, Summerside	o600 Class Patrol 305 Burgeo 310 Burin Multi-Task DFO CMRA Air-Gander, Summerside

Δ Planned in conjunction with 031
* Planned in conjunction with 034
+ Planned in conjunction with 032, 033
o Planned in conjunction with 002, 005, 031

TABLE 4-2 Cont

TRENTON SRR

SUB-AREA NAME	1976-1980 INCIDENTS		SCENARIOS		
	DISTRESS	OTHER	I	II	III
100 Thunder Bay	21	133	1. Whaler or Atlantic 2. CMRA 3. Air-Edmonton, USCG	CMRA Air-Edmonton, USCG	100 Thunder Bay 400 Marathon CMRA Air-Edmonton, USCG
101 Superior	9	34	1. CMRA 2. Air-Edmonton, USCG	CMRA Air-Edmonton, USCG	CMRA Air-Edmonton, USCG
102 N. Channel	10	79	1. CMRA 2. Multi-Task DFO 3. Air-Trenton, USCG	CMRA Air-Trenton, USCG	CMRA Multi-Task DFO Air-Trenton, USCG
103 Georgian Bay	39	429	1. 400/500 Tobermory 2. Whalers or Atlantic 3. CMRA 4. Air-Trenton, USCG	400/500 Tobermory CMRA Air-Trenton, USCG	300 Tobermory 400 Meaford Multi-Task DFO Air-Trenton, USCG
104 Huron	51	183	1. 400/500 Tobermory 2. CMRA 3. Air-Trenton, USCG	CMRA Air-Trenton, USCG	400 Goderich Multi-Task DFO CMRA Air-USCG
105 St. Clair	52	782	1. Whalers or Atlantic 2. CMRA 3. Air-USCG	CMRA Air-USCG	CMRA Air-USCG
106 Pelee	32	186	1. CMR 36 Amherstburg 2. CMRA 3. Air-USCG	CMR 36 Amherstburg CMRA Air-USCG	100 Amherstburg CMRA Air-USCG
107 Long Pt	51	301	1. CMR 36 2. CMRA 3. Air-USCG	CMRA Air-USCG	400 P. Dover CMRA Air-USCG
108 Niagara	65	618	1. CMR 36 Port Weller 2. Whalers & OPP 3. CMRA 4. Air-Trenton	CMR 36 Port Weller CMRA Air-Trenton	100 P. Weller CMRA Air-Trenton

TABLE 4-2 Cont

SUB-AREA NAME	1976-1980 INCIDENTS		SCENARIOS		
	DISTRESS	OTHER	I	II	III
109 Cobourg	48	662	1. OMR 36 Cobourg	OMR 36 Cobourg	400 Cobourg
			2. Whalers & OPP		
			3. CMRA	CMRA	CMRA
			4. Air-Trenton	Air-Trenton	Air-Trenton
110 Kingston	21	243	1. OMR 36 Kingston	OMR 36 Kingston	100 Kingston
			2. Whalers & OPP		
			3. CMRA	CMRA	CMRA
			4. Air-Trenton	Air-Trenton	Air-Trenton
140 Montreal	40	591	1. CMRA	CMRA	CMRA
			2. QPP		
			3. Air-Trenton	Air-Trenton	Air-Trenton
141 Quebec	47	256	1. OMR 36	OMR 36	100 Quebec 400 Quebec
			2. CMRA	CMRA	CMRA
			3. QPP		
			4. Air-Trenton	Air-Trenton	Air-Trenton

TABLE 4-2 Cont

VICTORIA SRR

SUB-AREA NAME	1976-1980 INCIDENTS		SCENARIOS		
	DISTRESS	OTHER	I	II	III
301 Victoria	92	1,562	1. Whalers/Atlantic 100 2. Multi-Task DFO 3. CMRA 4. Air-USCG	BCLS CMRA Air-USCG	400 Victoria Multi-Task DFO CMRA Air-USCG
302 Islands	44	943	1. Whalers/Atlantic 100 2. Hovercraft 3. CMRA 4. Air-USCG	BCLS CMRA Air-USCG	100 Ganges CMRA Air-USCG
303 Vancouver	332	6,611	1. Whalers/Atlantic 100 2. Hovercraft 3. Multi-Task DFO 4. CMRA 5. Air-Comox or USCG	BCLS Hovercraft CMRA Air-Comox or USCG	100 Vanc (2) Hovercraft (2) CMRA Air-Comox or USCG
304 Georgia	125	2,553	1. 2 CMR 36 2. Whalers/Atlantic 3. Multi-Task DFO 4. CMRA 5. Air-Comox	BCLS CMRA Air-Comox	400 Campbell R. Hovercraft CMRA Air-Comox
305 N.V.I.	104	1,103	1. *600 Class Patrol 2. 400/500 Bella Bella 3. 400/500 Port Hardy 4. Multi-Task DFO 5. CMRA 6. Air-Comox	*600 Class Patrol 400/500 Bella Bella (Vol) BCLS/CMRA Air-Comox	600 Patrol (1) 400 Bella Bella 400 P. MacNeil 310 Bull Harbour Multi-Task DFO CMRA Air-Comox
306 P. Rupert +S. Alaska	91	656	1. *600 Class Patrol 2. 400/500 P. Rupert 3. Multi-Task DFO 4. CMRA 5. Air-Masset 6. Whaler /Atlantic	*600 Class Patrol 400/500 P.R. (Vol) BCLS/CMRA Air-Comox	600 Patrol (1) 400 Prince Rupert 400 Masset 400 QCC Multi-Task DFO CMRA Air-Comox

* 1 - 600 Class Patrol

TABLE 4-2 Cont

SUB-AREA NAME	1976-1980 INCIDENTS		SCENARIOS		
	DISTRESS	OTHER	I	II	III
307 W.V.I.	124	1,547	1. DFO (Sinclair)		600 Patrol (1)
			2.		
			3. 400/500 Tofino	400/500 Tofino	310 Tofino
			4. 400/500 Bamfield	400/500 Bamfield	310 Bamfield
			5.		300 Winter Hrbr
			6. Multi-Task DFO		Multi-Task DFO
			7. CMRA	BCLS/CMRA	CMRA
			8. Air-Comox, USCG	Air-Comox, USCG	Air-Comox, USCG

TABLE 4-3

SUMMARY OF NUMBER OF VEHICLES

		I	II	82/83 SAR PLAN
HALIFAX	600	4	4	4
	400/500	8	8	3
	OMR 36	4	-	(300) 15
	200	2	2	2
		18	14	24
TRENTON	400/500	1	1	6
	OMR 36	6	5	(300) 1
	WHALER/ATL	8-10	-	5
		15-17	6	12
VICTORIA	600	1	1	1
	400/500	5	4	7
	OMR 36	2	-	(300) 4
	H/CFT	3	2	3
	WHALER/ATL	9-11	-	3
		20-22	7	18
TOTAL	600	5	5	5
	400/500	14	12	16
	OMR 36	12	5	(300) 20
	200	2	2	2
	H/CFT	3	2	3
	WHALERS/ATL	17-21	-	8
		53-57	27	54

4.17 No disposal allowance for surplus vessels currently on hand has been included in the costing, as this would bias the results towards the first two scenarios. What is portrayed is a "smoothed" cost for a single year's operation of each scenario.

4.18 Tables 4-4 through 4-5C summarize the costs of these scenarios.

Conclusions

4.19 The Team concludes that:

(1) Of the three scenarios it would appear that Scenario I offers the lowest dollar cost per response day, as well as improved coverage and a faster response. Scenario I attempts to make the most use of volunteers and to utilize lifeboats and cutters with an increased performance. Scenario II depends on the use of volunteers or vessels of opportunity and is the most costly in terms of dollars per response day because the larger resources are still required. Scenario III, the existing 1982/83 SAR plan, suggests a continuance of the existing operations without standards against which it can be evaluated; but it is less costly in response days than Scenario II.

(2) The 1982/83 SAR Plan can be improved on, to enable better coverage and faster response at lower cost.

SAR Resource Allocation

Description

4.20 An allocation model for SAR resources was prepared by the Directorate of Air Operations Research at DND. The result is shown below. It represents an initial approach to the program and is expected to be improved through application and testing. The operation of the Search and Rescue system can be represented as a connected series of events which define the SAR Time Line (Part III, Section 1, Figure 1-3). This Time Line represents the duration of the complete chain of events in a SAR incident, from the position of a client of the system or of the various participants of the alerting, responding and aiding system.

4.21 The duration is not constant. This is because each event is subject to delays from various causes. In addition, some events, notably those which involve the movement of Search and Rescue vehicles, incorporate delays which depend on the location of the incident.

4.22 It is convenient to describe delays in providing service by using a cumulative probability distribution. When the distribution for an event is known, it becomes possible to make a statement such as:

TABLE 4-4

TOTAL PROJECTED SCENARIO COSTS SCENARIO COMPARISONS

($000's)

	SCENARIO 1	SCENARIO 2	SCENARIO 3
PY	1,630.0	1,409.5	1,676.0
O & M	106,298.3	97,399.4	109,278.9
CAPITAL	21,407.7	20,735.0	23,674.4
G & C	250.0	250.0	250.0
Annual Total..................	127,956.0	118,384.5	133,203.3
RESPONSE DAYS	23,716.0	9,248.0	20,113.0
MULTI-YEAR CAPITAL OUTLAY (1)	11,123.8	1,750.0	34,035.0

(1) This is the difference between scenario requirements and the present fleet. No consideration is given for surplus vessels in the present fleet. Existing fleet as per SAR Plan 1982/83.

TABLE 4-5A

SCENARIO 1

COST SUMMARY (000's)

DEPT	RCC	NO. VESSELS	PY	O&M	CAP	RESPONSE DAYS
CCG	HFX	19	277	$15,466.0	$4,287.6	6,055
	TRN	18	90	2,668.6	401.5	6,248
	VIC	23	180	8,094.2	2,143.6	7,720
	OTHER COSTS	-	183.5	8,104.0	3,183.0	-
	SUB TOTAL	60	730.5	34,392.8	10,015.7	20,023
CMRA	HFX	-	-	41.3	-	-
	TRN	-	-	50.5	-	-
	VIC	-	-	601.5	-	-
	SUB TOTAL	-	-	693.3	-	-
DFO	HFX	8	29.5	1,134.7	-	2,317
	TRN	2	6.0	202.3	-	366
	VIC	6	38.0	1,303.9	-	1,010
	SUB TOTAL	16	73.5	2,640.9	-	3,693
DND	HFX	-	-	23,357.3	-	-
	TRN	-	-	18,392.5	-	-
	VIC	-	-	22,044.2	-	-
	OTHER COSTS	-	826.0	4,777.3	11,392.0	-
	SUB TOTAL	-	826.0	68,571.3	11,392.0	-
OVERALL TOTAL		76	1,630	106,298.3	21,407.7	23,716

Npte: 1) Incremental vessels capital cost $11,123.8K

2) Table does not include $4,507K standard depreciation and attrition on DND aircraft.

TABLE 4-5B

SCENARIO 2

COST SUMMARY (000's)

DEPT	RCC	NO. VESSELS	PY	O&M	CAP	RESPONSE DAYS
CCG	HFX	15	253.0	$14,798	$4,147.6	4,655
	TRN	7	44.0	1,491	327.5	2,248
	VIC	8	103.0	5,657	1,685.0	2,345
	OTHER COSTS	-	183.5	8,104.0	3,183.0	-
	SUB TOTAL	30	583.5	30,050.0	9,343.1	9,248
CMRA	HFX	-	-	102.6	-	-
	TRN	-	-	126.5	-	-
	VIC	-	-	601.5	-	-
	SUB TOTAL	-	-	830.6	-	-
DND	HFX	-	-	23,357.3	-	-
	TRN	-	-	18,392.5	-	-
	VIC	-	-	19,991.7	-	-
	OTHER COSTS	-	826	4,777.3	11,392	-
	SUB TOTAL	-	826	66,518.8	11,392	-
OVERALL TOTAL		30	1,409.5	97,399.4	20,735	9,248

Note: 1) DFO excluded from Scenario 2

2) Incremental vessels capital cost $1,750K

3) Table does not include $4,507 standard depreciation and attrition on DND aircraft.

TABLE 4-5C

SCENARIO 3

COST SUMMARY (000's)

DEPT	RCC	NO. VESSELS	PY	O&M	CAP	RESPONSE DAYS
CCG	HFX	25	320	$17,912	$5,154.5	7,821
	TRN	13	101	4,751	1,209.1	4,128
	VIC	16	174	9,200	2,735.8	4,985
	OTHER COSTS	-	183.5	8,104	3,183	-
	SUB TOTAL	54	778.5	39,967	12,282.4	16,934
CMRA	HFX	-	-	41.3	-	-
	TRN	-	-	50.5	-	-
	VIC	-	-	120.4	-	-
	SUB TOTAL	-	-	212.2	-	-
DFO	HFX	6	27.5	1,074.7	-	1,803
	TRN	2	6	202.3	-	366
	VIC	6	38	1,303.9	-	1,010
	SUB TOTAL	14	71.5	2,590.9	-	3,179
DND	HFX	-	-	23,357.3	-	-
	TRN	-	-	18,392.5	-	-
	VIC	-	-	19,991.7	-	-
	OTHER COSTS	-	826	4,777.3	11,392.0	-
	SUB TOTAL	-	826	66,518.8	11,392.0	-
OVERALL TOTAL		68	1,676	109,278.9	23,674.4	20,113

Note: 1) Incremental vessels capital cost $34,035K

2) Table does not include $4,507K standard depreciation and attrition on DND aircraft.

> "In 90 cases out of 100, this event will be complete in two hours and twenty minutes or less".

Such a statement shows the probability that an event is completed (in the example P = 90%) with the time necessary to achieve that level (2 hours and 20 minutes).

4.23 Mathematical techniques exist to compute the cumulative probability distribution which results when two or more events, each with its own distribution, occur in series. All events which do not depend on the location of the incident can be handled in this fashion.

4.24 In principle, this technique can be applied to each point in Canada, thereby incorporating the geographic factor. However, the resulting matrix of numbers becomes enormous. Much of the pertinent information can be presented by specifying a probability level (say 90%) and plotting contours of constant response times on a map. From the map the conclusion could be drawn that:

> "There is a 90% probability of completing the chain of SAR events at latitude 50° N, Longitude 100° W within 4 hours"

The contours would show areas where the response is slow and where it is fast. Maps could be prepared for various probability levels.

4.25 The Time Line defines relevent events which constitute the Search and Rescue process. The first seven events, Alerting (4) and Responding (3)) make up the "First Potentially Useful Response". For the purpose of this analysis these are collected into four categories of events and measured as Times: Notification Delay (T1), RCC Response Time (T2) Launch Time (T3) and totalled as the first potentially useful response time (T1, T2 and T3). The following discussion concentrates on the calculation of this quantity. The reader should note, however, that the techniques involved can be employed to determine other response times so long as they are formed by consecutive events from the event chain.

4.26 The SARSTATS data file contains the notification, reaction and launch times for SAR cases over the past five years. The data can be tabulated for all of Canada, for each RCC, for day or night, for each month, etc. Figures 4-6 through 4-8 present representative distributions for the three events. Figure 4-9 shows the resulting cumulative distribution for all three events.

4.27 To demonstrate the geographic dependence of response, a maritime case has been assumed. The progress of a rescue vessel as it makes its way from a base to various incident locations can be progressively displayed by computer output. An analysis was made, placing a SAR vessel at Halifax and demonstrating the coverage at 75 nautical mile intervals. Figure 4-10 illustrates the result at one interval.

Alternate Scenarios

4.28 The curves and maps which have been presented can be modified to show the effect of several options open to the SAR planner. For example, suppose a faster notification process becomes feasible. The planner can obtain an estimate of the notification time distribution for the new system. Figure 4-11 illustrates the distribution for notification time reduced from that of Figure 4-6 by a factor of ten. This distribution then forms new input for the calculation procedure (see Figure 4-12). The new overall cumulative distribution can be obtained, compared with the old one and used to replot the curves on the map.

4.29 The potential effect of introducing a new SAR resource, say a faster boat, or moving an existing resource, is easily examined by invoking the graphic portion of the model with new data.

Observations

4.30 Analysis of alternative methods of SAR resource allocation produces the following results:

(a) the most effective SAR marine response at the lowest cost, as measured against the goal of having a SAR system respond within a fifty mile radius of a SAR base, is to make the most possible use of volunteers and to use CCG lifeboats and cutters with an increased performance over the present inventory. Scenario I resourcing provides the details.

(b) A basic operations research model is available to assist in comparing the effect of various SAR response time elements and the positioning of marine SAR vessels.

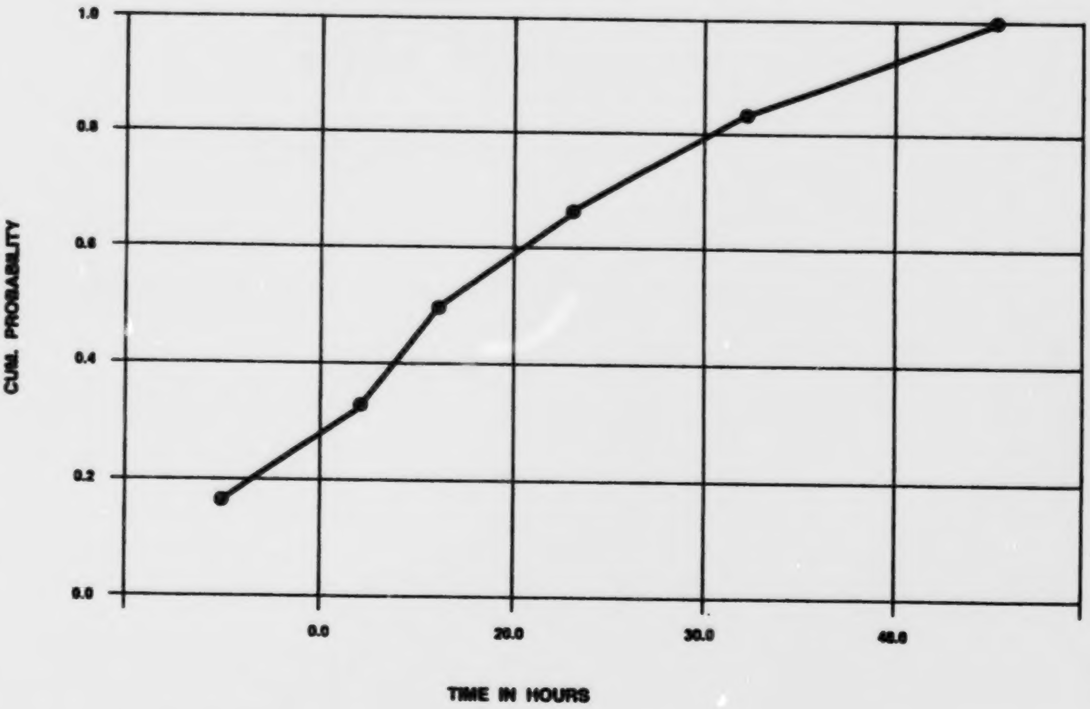

FIGURE 4-6 REPRESENTATIVE NOTIFICATION DELAY (T1)

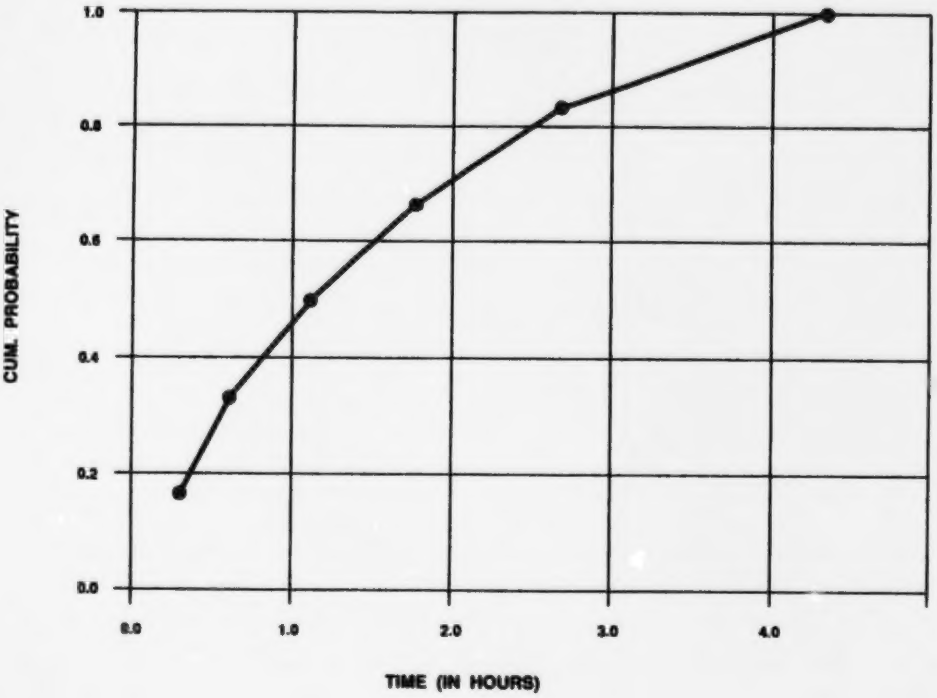

FIGURE 4-7 REPRESENTATIVE RCC RESPONSE TIME (T2)

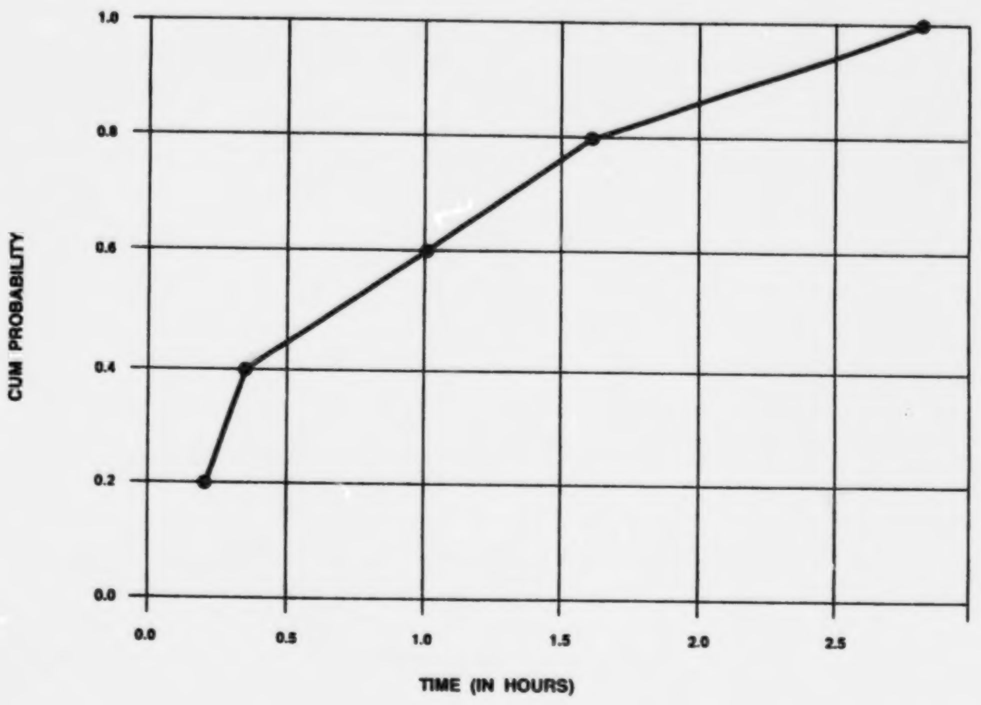

FIGURE 4-8 REPRESENTATIVE LAUNCH TIME (T3)

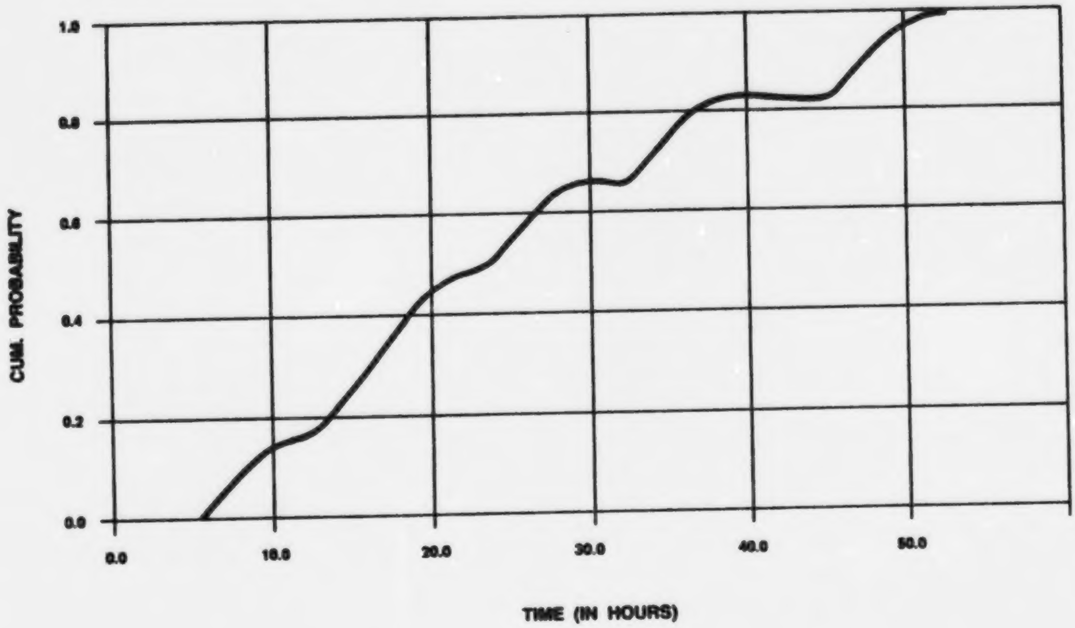

FIGURE 4-9 REPRESENTATIVE SAR RESPONSE (T1 + T2 + T3)

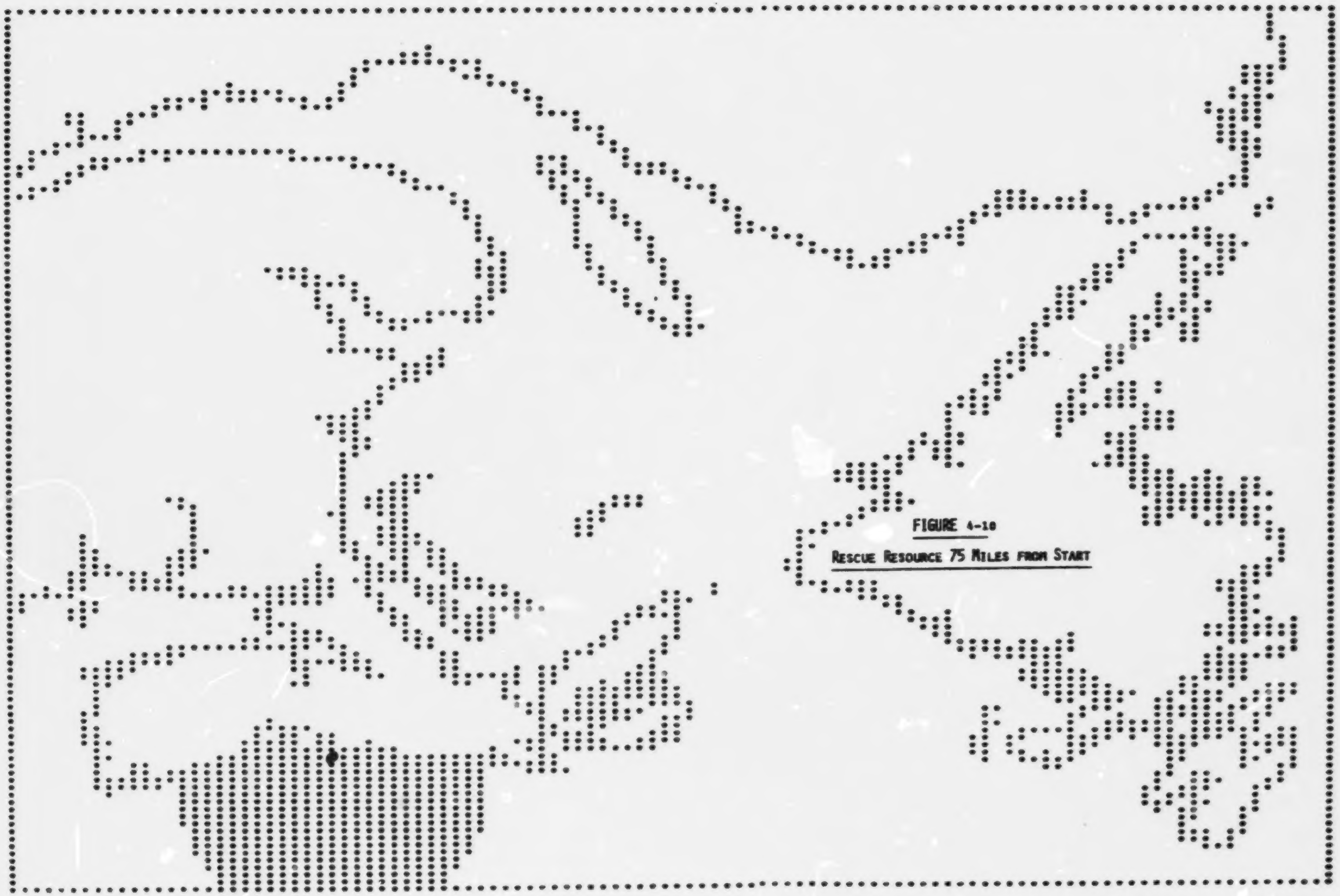

FIGURE 4-10

Rescue Resource 75 Miles from Start

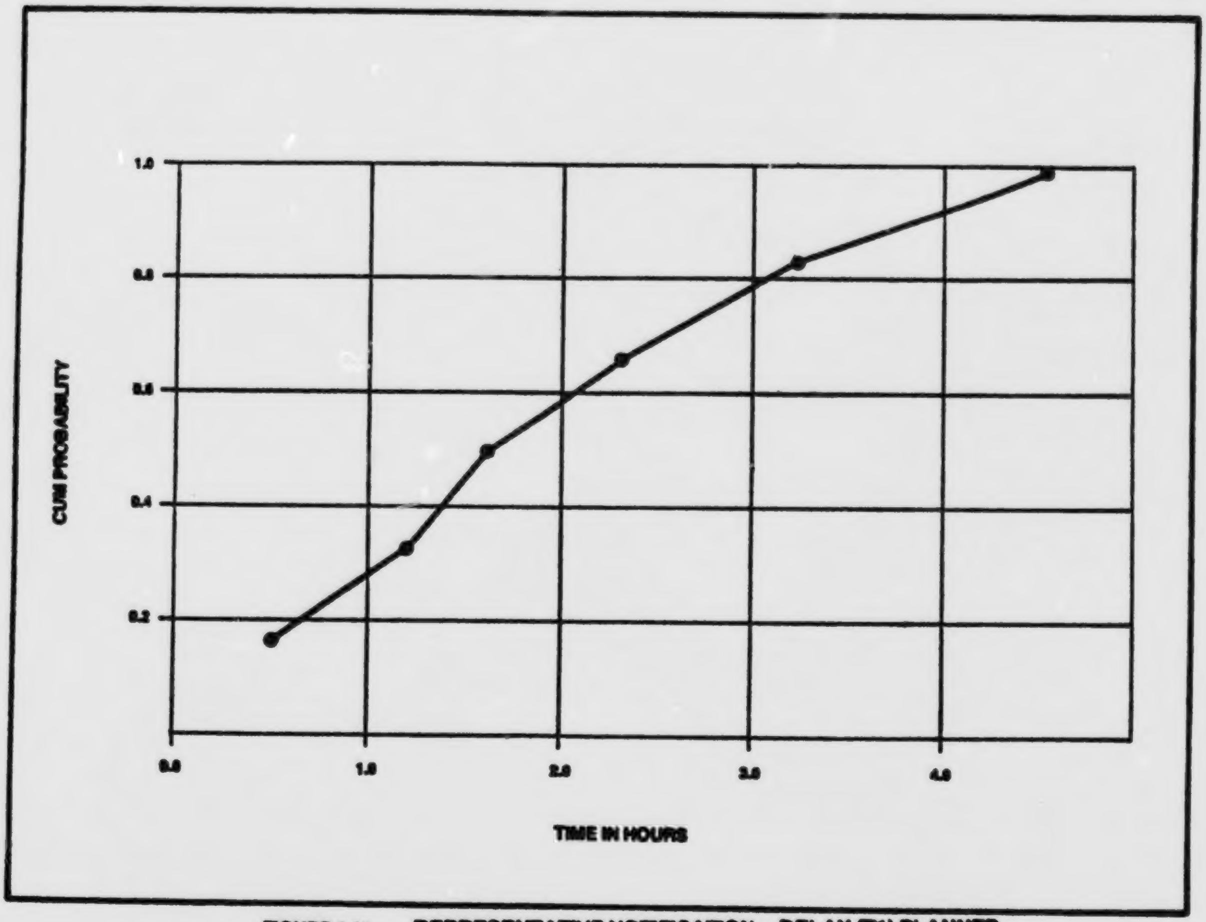

FIGURE 4-11 REPRESENTATIVE NOTIFICATION DELAY (T1) PLANNED

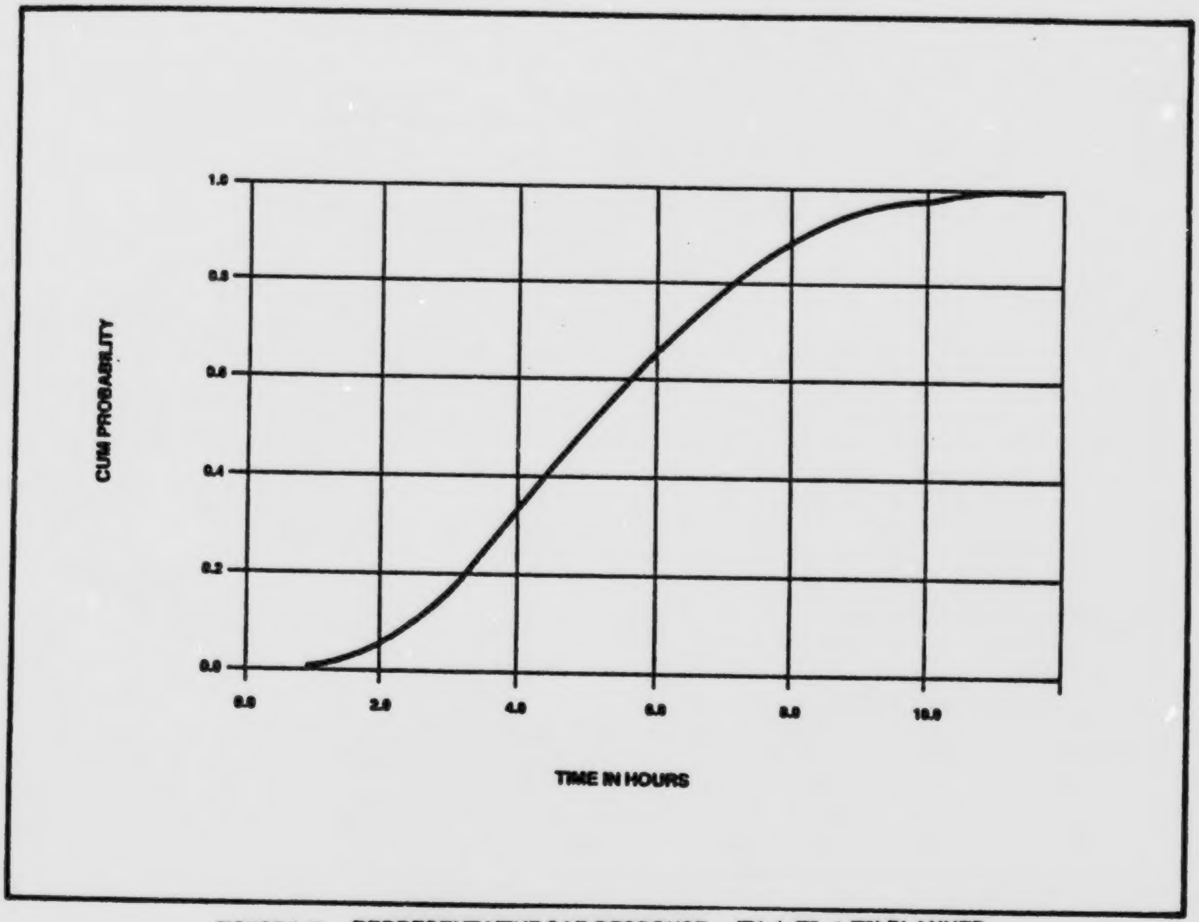

FIGURE 4-12 REPRESENTATIVE SAR RESPONSE (T1 + T2 + T3) PLANNED

SECTION 5 - THE SAR OPERATIONS PROGRAM: ITS DELIVERY AND EVALUATION

The Problem

5.1 For the purpose of examining, managing or evaluating the Operations element of the SAR Program, it has proven difficult to come to grips with the issues and what the Program is supposed to do. Missing from a cohesive picture are guiding policies, a ministerially-approved statement of objectives, a logical assignment of tasks and activities to departments, goals and standards to define a desired level of service, an agreed system of performance measurement and management information for Program planning. As a consequence, without these specifics, the Team has conducted mainly a review of the SAR Program rather than a precise evaluation of its results. However, the Team has developed a logical structure within which planning, organizing, resourcing, delivering, controlling and co-ordinating could be done in the future. Program evaluation could also be made using the same means.

The Approach

5.2 Assuming that the federal government considers it has a role in ensuring SAR service, a specific approach to the Operations Program is possible. Part II and Part III of this report form the basis for organizing the SAR Program and for developing policy on the kinds and level of Operations service to be delivered. The structure suggested is to:

(a) Identify and describe the specifics of the SAR scene and the characteristics of the probable clientele or target population.

(b) Establish a series of Operations objectives for the defined need of the clientele.

(c) Define the survivability time of the clients and the environmental conditions faced by the air and marine public.

(d) Estimate the response time practicable for SAR aircraft and vessels.

(e) Determine the degree to which victims of distresses can improve their survival time through the use of on-board survival equipment. The goal is to ensure that, with self-help, survival standards are equal to or greater than the SAR response times that are possible and desired.

(f) Develop, promulgate and enforce on-board equipment standards and educate aircraft and marine operators on the minimum anticipated survival times established above.

(g) Develop the SAR Incident Time Line to describe the unfolding of a SAR incident, incorporating events from the viewpoint of both the client and the response system.

(h) Define the series of activities and events which comprise the Time Line.

(i) Develop a series of assumptions, descriptors and indicators based on the activities and events of the Time Line.

(j) With feedback from actual Operations and through policy decisions, develop objectives, goals and standards to describe the desired level of service output of the SAR Program in alerting, responding and aiding.

(k) Develop alternative methods of delivering a SAR Operations service by considering trade-offs among federal and other government resources, volunteers, self-help, contract services and the like.

(l) Select the best method of delivering the Operations service.

(m) Establish a measurement and information reporting system which indicates how the system is performing.

(n) Using the structure that results from this process, implement the SAR Operations Program.

The Results

5.3 By following this systematic process, responsible authorities will have a functioning Program with many beneficial results. First of all, it will provide the public with the best service possible within the available SAR budget. Secondly, management at all levels will have an organized structure for assessing and examining policy, measuring the effectiveness or efficiency of the Program, comparing alternative methods of delivering the SAR service and finally, evaluating the Program for the achievement of its objectives, goals and other outputs.

5.4 The "Operations" and "SAR Program" parts of this Report provide amplification of all the specifics outlined above for a SAR Operations Program.

Objectives Achievement

5.5 After reviewing the structure suggested above, it is useful to comment on the degree to which the present tentative objectives are achieved. Because there are no standards, comments can only be subjective.

5.6 The objectives of the SAR Operations element of the Program are restated below from Part II, Section 1.

The National Search and Rescue Program (SAR) objectives for areas under Canada's jurisdiction may be summarized as follows:

(a) To have in place, a SAR operations capability to:

- i) know of the occurrence of all air and marine SAR incidents (alerting);
- ii) locate all missing air and marine vehicles and personnel involved in distress incidents (responding);
- iii) save the lives of all survivors of air and marine distress incidents (aiding);
- iv) minimize loss of property pending availability of salvage services, especially for marine distress incidents (aiding);
- v) provide humanitarian assistance and civil aid (responding and aiding);
- vi) fulfill international SAR obligations.

(b) To make the best use of associated services in support of SAR operational and prevention activities.

General comment on achievement of these objectives is developed below. Specific comment is contained in the relevant sections of this Report. Once again it is stated that, without standards, specific effectiveness assessment is difficult.

Observation

Alerting

5.7 The systems in place to provide service and safety mechanisms for air and marine navigation generally serve SAR well. A number of needed improvements have been identified for procedures, communications equipment, VHF/DF installations and the better employment of emergency radio frequencies. In the marine world, the role of visual alerting and radio devices is important and should be enhanced. The most significant point identified is that the time taken to learn of a distress frequently far exceeds the time to respond to it. Therefore, it would appear fruitful to emphasize procedures (voyage plans), techniques and equipment (radio and alerting devices) that reduce this alerting time. The current emphasis upon providing a reliable emergency locator beacon coupled with satellite aided receiving and locating systems is well placed.

Responding

5.8 As already highlighted, there are no stated survival time goals, therefore, the responding process can only be judged on the basis of doing the best it can. In the air world, resources are approximately correct with some specific improvements in capability and equipment identified by region. Where search objects have been found, average transit times are relatively short (under two hours) and approximately 80% of air distresses occur within 400 miles of a SAR base. In this context, SAR air bases are reasonably well located for fixed wing response, but perhaps less so for rotary winged aircraft. Hours expended in lengthy air searches consume the majority of aircraft hours devoted to SAR and herein lies the potential for reducing SAR costs, most likely by improving visual search methods and making location of downed aircraft easier.

5.9 In the marine world, vessels of opportunity are the best SAR rescue source and their capabilities should be enhanced. For vessels in off-shore waters, a position locating system is needed to locate and determine the SAR aiding capabilities of the vessels of opportunity nearest to a distress site. Government marine SAR response capabilities should place more emphasis on the use of smaller, faster craft and the greater employment of volunteers.

5.10 Co-ordination and control of responding is incorrectly structured. SAR response has become a marine response in the main and the control and co-ordination of SAR Operations should be organized to match this situation. More localized control of marine SAR would be an improvement, with implementation through the creation of a series of marine RCCs and sub-response centres staffed by mariners. Air response should become more centralized through one RCC because the numbers of air SAR incidents are more stable and more evenly distributed in time.

5.11 Finally, contingency planning and resourcing for responding to major passenger carrier incidents should be executed with more precision.

Aiding

5.12 Air aiding is well done, although there are a few opportunities for improvement of detail. The marine world requires a specific government policy for the ubiquitous problem of providing assistance in non-distress cases, in particular for towing or emergency fuel service. The first action utilizes a significant number of CCG vessel hours. In addition, a higher level of first aid training is necessary for CCG/DFO crewmen.

Success

5.13 Without standards, none of the above can be assessed for effectiveness or policy achievement. In general, the SAR Operations service was found to be well delivered by highly motivated personnel, proud of their role. In detail, there is much room for improving service in specific areas of the Operations program. A useful improvement could be achieved by implementing a process and structure for Program delivery similar to the one outlined in this Section.

Summary

5.14 A precise evaluation of SAR Operations requires an orderly Program structure. SAR lends itself to this kind of orderly structure, but one is not now in place for the National SAR Program. Consequently, in conducting the evaluation it was determined that a program review was the most that could be done. To do more, there must first be a ministerially-approved set of goals and standards against which to assess Program outputs. The next logical step is to establish a program structure, fine tune its resources and outputs, then evaluate it in relation to its objectives and results.

SECTION 6 - CONCLUSIONS

6.1 The observations made in this part lead to the following conclusions:

Section 1

(a) Survivability in both the air and marine environments is dependent on education, time, clothing and season. The public would know better how best to protect itself, and would have a better understanding of the extent to which they must be responsible for their own survival if levels of service standards were published.

(b) Electronic locator beacons used in the air mode reduce alerting and response time but also create a large number of false alarms. Failure to transmit on impact is common and indicates a need to improve their reliability and design. Further, there is little research and development in Canada into the use of alternate visual or electronic distress signalling aids. Thus, improved notification, detection and location technology which could substantially improve the performance of the SAR system is not being fully exploited.

(c) The progress of a SAR incident from its origin to its termination is not adequately defined. Without this no measure of operations performance is possible.

(d) Stricter radio discipline is necessary in the marine mode. A guard mode on marine radio distress channels would enable more reliable and faster distress alerting.

(e) Improved information on vessel positions could enable better use of the excellent response capability of vessels of opportunity.

(f) The federal marine and air response capability is well trained and equipped. However, the effectiveness of some existing SAR vehicles for their SAR role has been questioned.

(g) The provision of SAR equipment in all suitable government aircraft and vessels would enhance their ability to locate and to provide a response to vehicles declaring distress.

(h) The use of volunteers to man a lifeboat appears to have been successful. Extensive use of full or partial volunteer crews should be introduced to limit the cost of operation of CCG vehicles and to improve SAR response.

(i) Multi-tasking of DFO vessels, although it creates an increased number of responses, provides a valuable additional resource for the SAR program.

(j) There is a need for contingency plans to provide timely and co-ordinated response to maritime disasters on the high seas.

(k) There is a need for government policies for towing vessels, for supplying fuel and mechanical assistance and for cost recovery for these services.

(l) There is a need for a clearly identified federal SAR program accompanied by a set of policies, levels of service, standards and procedures against which to measure program performance.

(m) The scenario analysis carried out by the Team confirms that such an analysis can be useful for improving force postures and that there are better coverage, faster response and lower cost scenarios than the proposed 1982/83 SAR Plan.

(n) RCC effectiveness should be improved by the acquisition of new equipment, refurbishment of facilities and staffing with SAR trained personnel experienced in the SAR response area. Further, RCC organization and structure should reflect the mainly marine incident work-load where this is the case.

(o) Vehicles dedicated to search and rescue need special identification so that the public can readily recognize them.

PART IV - SAR PREVENTION

SECTION 1 - INTRODUCTION

1.1 The major aim of this part of the report is to address the evaluation question:

> Is it likely that broadened air and marine regulations, an expanded safety education program and increased enforcement action, singly or together, would reduce the occurrence of SAR incidents and consequently decrease the demand for SAR resources? Would targetting these programs at the owners and operators of:
>
> - fishing vessels;
> - pleasure craft;
> - small commercial and private aircraft,
>
> who are those most frequently involved in SAR incidents, be an effective strategy? What are the rough costs of such widened prevention activities?

To answer these questions, first SAR prevention is defined and placed in relation to explicit and implicit objectives, related programs and organizations; second, target populations are specifically identified; third, existing SAR prevention activities, including outputs, are described and analyzed; and fourth, observations and conclusions are derived from the foregoing.

Methodology

1.2 This evaluation of SAR prevention is based primarily on a review of documentation and analysis of available statistics concerning the characteristics of vehicles and persons involved in aviation and marine SAR incidents. In the case of civil aviation SAR distress incidents, a detailed analysis of case summaries of DOT accident investigations was conducted to identify specific target populations. Similarly, an extensive analysis of data in the DND SARSTATS was conducted to identify cause factors in marine SAR incidents, to determine the measures that would help prevent these incidents and to discover the target populations at which these measures should be directed.

1.3 The strengths and weaknesses of existing aviation and marine SAR prevention in achieving objectives were derived mainly by analyzing responses to the Team's interview questions. These questions were posed to a broad spectrum of the foreign and national communities including aviation and marine safety experts in government and private sectors, insurance experts, federal government headquarters and field staffs and private volunteer groups connected with aviation and marine activities.

1.4 Recommendations are based on the conclusions arrived at through statistical analysis, interviews and journalistic evaluation.

SECTION 2 - OVERVIEW OF SAR PREVENTION

Definition

2.1 "SAR prevention is an activity designed to deter the occurrence of aviation and marine SAR incidents and, if prevention measures fail, to enhance personnel survival following the event."

2.2 This definition has been developed by the Team from the logic explained in Part II Section 1 - the SAR Program. It should be noted that this definition encompasses SAR distress and non-distress incidents, both of which can result in the expenditure of SAR operations resources. As used in this report, SAR prevention is confined to the sub-activities of investigating, regulating, enforcing and promoting/educating.

2.3 SAR Prevention activities are expected to deter the generation of aviation and marine SAR incidents and to improve the chances of survival for those involved, until external aid arrives at the scene of the incident. The Team is of the view that this definition reflects accurately what SAR planners and operators believe the SAR prevention activity does, in some cases well, in others badly.

Objectives

National SAR Prevention Policies and Objectives

2.4 In 1976 Cabinet distinguished between SAR prevention and SAR operations and directed that priority should be given to minimizing the occurrence of incidents through improved prevention, regulation and enforcement. Subsequently, the Prime Minister designated the Minister of National Defence as the lead minister and government spokesman on all SAR matters. He stressed the application to marine SAR and that priority should be given to the improvement of safety measures to minimize SAR incidents. He also noted that the Minister of Transport has prime responsibility for the development and enforcement of programs to promote marine and air safety.

2.5 National objectives for SAR, reviewed by ICSAR in 1979, were: to detect distress, to prevent loss of life and personal injury; and where possible, to minimize damage to or loss of property. With respect to SAR prevention, the following was stated:

> "SAR Prevention is aimed at improving safety measures to prevent the occurrence of distress situations through education, regulation and enforcement."

2.6 Departmental SAR Prevention objectives were stated as follows:

a) National Defence

"To maintain operational liaison with DOT/AIR, DOT/CCG and other appropriate authorities, through such procedures as Searchmaster reports and SAR incident reports, to promote the highest level of safety in the civil aeronautic and marine environments", and "To support Transport Canada (CATA) and Transport Canada (CMTA) in SAR prevention through participation in educational programs".

b) Transport

i) CMTA/CCG - "in co-operation with other public and private groups, having marine safety interests or responsibilities, to promote the highest practicable level of marine safety, in order to minimize demands for SAR operations".

ii) CATA - "in co-operation with DND and in consideration of recommendations from that department, to develop and implement SAR prevention programs designed to promote a high level of safety in civil aeronautics".

c) Fisheries and Oceans

"To maintain awareness of safety implications in all aspects of the planning, management and execution of departmental programs".

Implicit Sub-Activities and Sub-Objectives

2.7 ICSAR SAR prevention objectives were examined by the Team during the assessment phase of this evaluation. As shown in this evaluation assessment, they were found to lack a suitable base for effectiveness evaluation. As a result, the Team devised a set of general SAR prevention sub-objectives and sub-activities, and subsequently, derived specific sub-objectives for the four sub-activities identified in the evaluation assessment.

2.8 Accordingly, the following four SAR prevention sub-activity objectives were judged by the Team to be implicit to the achievement of the overall SAR prevention objective and (departmental) ICSAR aspirations in this regard. These sub-objectives are:

(a) INVESTIGATING: "To determine the causes of all aviation and marine SAR incidents".

(b) REGULATING: "To provide essential SAR prevention standards for aviation and marine vehicles, equipment and personnel, including personnel survival standards."

(c) ENFORCING: "To ensure compliance with aviation and marine SAR prevention standards."

(d) PROMOTING AND EDUCATING: "To make the aviation and marine publics aware of SAR prevention measures.

SAR Prevention and Safety Program Linkages and Differences

2.9 It is clear from the foregoing statements that there is a direct linkage and in certain instances an overlap, between the activities of SAR prevention and those of existing aviation and marine safety programs. In fact, departments assigned safety program responsibilities do perform investigating, regulating, enforcing and promoting/educating as well as external navigation assistance activities necessary to ensure the conduct of safe flight and voyages. The primary focus of these safety programs is to prevent accidents and incidents which endanger the safety of persons. By definition, they are directed also at preventing that sub-population of accidents and incidents which normally result in SAR distress incidents, but also by definition, they are not directed primarily at preventing search operations caused by false alarms and other occurrences where the safety of persons was not at stake.

2.10 It would be reasonable to state that in preventing the occurrence of an accident or an incident, a SAR incident may have been avoided since a SAR incident is one where SAR resources are employed in its resolution. In the design of a safety program however, it is of the utmost importance to be able to determine the cause of the occurrence, not the characteristics and conditions of the occurrence which caused a SAR reaction.

2.11 For example, frequent failure of a particular steering mechanism in power boats suggests that the manufacturer or builder should be contacted and attempts made to correct the problem. Some of the failures may have resulted in a SAR incident but probably most would not. Nevertheless, it could be shown that a vessel with this steering mechanism was more likely to be involved in a SAR incident than other vessels. A relatively simple prevention procedure would reduce this probability if the particular problem were known to exist. At the present time, the most frequent type of non-distress emergency recorded in SARSTATS is "broken down". This is recorded under cause as "mechanical failure", but no further information is available.

2.12 A considerable body of knowledge and expertise exists in the field of aviation and marine safety. The application of this capacity to the SAR environment is just developing. Because of this, the two approaches should not overlap but complement each other. Search and Rescue resources must respond to the specific populations involved in accidents. If SAR incidents are to be prevented, it is necessary to highlight the characteristics of these populations and their behaviour to the safety program, otherwise a focus on SAR is not maintained. An attempt to address programs of prevention by groups outside the safety field would lead to unnecessary duplication in effectiveness, since the full range of expertise would not be brought to bear.

2.13 It follows that the mix of measures required to prevent accidents and incidents that result in a SAR distress incident may be different from the mix required to deter the generation of other types of SAR incidents. Therefore, the desirable mix from a SAR viewpoint can be quite different from the present mix of safety measures. Accordingly, from the SAR viewpoint, priorities for improvement of safety programs may well be different from priorities currently assigned to improving safety measures in toto.

2.14 These distinctions are important for understanding the extent to which existing safety programs may already be detering SAR incidents and from a SAR viewpoint, how the development of safety programs should be influenced. Finally, this understanding is essential to making good decisions on whether the cost of changes in priorities for developing safety programs from the SAR viewpoint, should or should not be attributed to the SAR program; and how SAR program planners should be involved.

2.15 The descriptive profile and analysis to follow in this section and in subsequent sections of this Part and Part V, will highlight the relationships and differences of the SAR prevention activity and its required outputs, compared with those produced by existing aviation and marine safety programs and their accompanying organizations. As will be seen, the predominant safety organization in Canada for aviation and marine SAR prevention is the Department of Transport whose civil aviation and marine safety programs produce most of those measures required to achieve SAR prevention objectives. In the case of the military, this profile and analysis will not examine and assess Canadian Forces safety programs as these military forces form a small part of the client population. Generally, they are subject to more stringent safety criteria than the civil client population supervised by the Department of Transport and other civil safety organizations.

Organizations Involved in SAR Prevention

Department of Transport

2.16 Roles and Responsibilities: Within the context of SAR prevention, the Department of Transport is responsible for the development and enforcement of programs to promote aviation and marine safety. Also, DOT is expected to produce safety measures to minimize SAR incidents. (Refer para 2.4)

2.17 Strategic Objective: The strategic objective of the Department of Transport that relates directly to SAR prevention is "to ensure an adequate level of safety is provided for the national civil aviation and marine transportation systems".

2.18 It is not clear whether this objective includes those segments of the national aviation and marine communities not engaged in transportation, for example, recreational flyers and boaters.

2.19 Safety Program Activities: Generally, DOT performs the following aviation and marine safety activities which relate directly to the achievement of SAR prevention objectives.

- Investigating events that led to an accident or incident, establishing causes by detailed analysis and notifiying other agencies of safety deficiencies;
- Regulating by developing and promulgating vehicle safety, personnel safety and survival standards for the public and ensuring compliance by monitoring, inspecting, certifying and licensing aviation and marine vehicles, component equipment, personnel, facilities and commercial enterprises engaged in aviation and marine transportation activities.
- Enforcing compliance with safety standards through administrative and judicial measures; and
- Promoting safety awareness and Educating aviation and marine publics in safety and personnel survival measures.

Not included in the above are other safety activities which involve the provision and operation of aviation and marine navigation, information and weather services. Since these services impinge on the effectiveness of both SAR operations and prevention, they are described and assessed in Part V of this report under the title "Associated Activities".

2.20 Safety Program Organizational Structure: The Canadian Air and Marine Transportation Administrations (CATA & CMTA) are the major DOT organizations which plan, co-ordinate and execute civil aviation and marine safety activities directly involved with SAR prevention. The Administrators of these organizations manage and resource the Directorate of Civil Aeronautics (DGCA) and the Canadian Coast Guard (CCG), the primary subordinate organizations responsible for federal civil aviation and marine safety activities. Both these organizations are functionally supported by safety staffs of the six CATA and five CCG regional offices located across Canada.

CATA/DGCA Organizations

2.21 The major CATA organizations directly involved in producing SAR Prevention outputs are:

2.22 Aviation Safety Bureau (DAS) - This Branch develops, co-ordinates and directs national investigation and analysis of civil aircraft accidents, incidents and aviation hazards. It also develops and provides a national program of safety information, education and motivation for the civil aviation community of Canada.

2.23 Aeronautical Standards and Legislation (DSL) and Legislative Review Branches (DLR) - These Branches are responsible for the development and maintenance of aeronautical standards and legislation and the air information service vital to the safe, efficient control of civil aviation in Canada. The senior Director (DSL) is also reponsible for the Legislative

Review Branch and is Head of the Aeronautics Act Task Force which currently is reviewing all aspects of aeronautics legislation, enforcement procedures and policies.

2.24 Aeronautical Licensing and Inspection Branch (DLI) - This Branch develops and implements policy, procedures and standards for all civil aviation personnel licensing. Specifically, its staff controls and develops aviation personnel examinations, flight training standards, and issues all personnel licenses; applies standards to domestic and national air carrier operations; and administers a licensing program of navigational and landing systems for national airports. DLI also produces policies and procedures for the enforcement of regulations, standards and directives.

2.25 Airworthiness Branch (DAB) - This Branch is responsible for the management of all airworthiness programs, approvals and continuing safety of all civil aeronautics products manufactured or operated in Canada, and the continuing airworthiness support for all Canadian manufactured aeronautics products in foreign countries.

2.26 Full details of the major functions and responsibilities of these organizations were recently published in reports of the Commission on Aviation Safety and are not given here.

CMTA/CCG Organizations

2.27 The major CCG organizations directly involved in SAR prevention are:

2.28 Casualty Investigation (CCGI): This office is responsible for performing casualty investigations and for recommending the development of proposals for new or revised legislation, regulations and directives in light of their findings. Casualty Investigation prepares and analyzes statistical data on marine casualty trends and incidents, assesses their human, navigational or equipment problems and recommends remedial measures.

2.29 Legislation Development (CCLM): This office is engaged in the preparation of the Maritime Code, which will eventually replace the Canada Shipping Act. It is responsible for the Arctic Waters Pollution Prevention Act, the Carriage of Goods by Water Act and the Government Vessels Discipline Act. Also, it develops policy alternatives for shipping legislation, represents the Department at interdepartmental meetings concerning proposals for new or amended legislation and prepares documents and assists in the submission of legislation to Parliamentary Committees.

2.30 Ship Safety Branch (DCGS): The Ship Safety Branch has the responsibility for developing and applying safety standards for all aspects of marine operation. This includes design, construction, operation, equipment, navigation, cargo and personnel standards. Also, as part of its overall responsibilities, this Branch drafts and amends the Small Vessel Regulations and Boating Restriction Regulations, tests and enforces small boat constructions standards. In addition, a member of this branch acts as chairman of the Small Craft Committee of the Marine Safety Advisory Council (MSAC). Finally, the Branch provides technical advice on safety requirements to other government departments and agencies, other groups in DOT (e.g. to SAR for the Canada Boating Handbook), to the marine industry and provides expert witnesses at court hearings.

2.31 Search and Rescue (CGVR): The SAR division has a headquarters superintendent position responsible for the Canadian Marine Rescue Auxiliary (CMRA) and Prevention, and an officer's position for Education and Prevention. Since 1977 this office has co-ordinated a SAR prevention program including the preparation of educational material such as pamphlets on boat equipment, films, media promotion and the Canadian Boating Handbook, which has a distribution close to one million. This organization has also developed an extensive small craft courtesy inspection program.

2.32 Marine Safety Advisory Council (MSAC): MSAC comprises representation from all aspects of marine industry and, in particular, the Small Craft Committee chaired by the CCG which involves representatives from the Canadian Yachting Association, Canadian Power Squadrons, Allied Boating Association, Canadian Boating Federation, the Canadian Red Cross, Canada Safety Council, the Ontario Marine Operators Association, the Royal Lifesaving Society and other groups. All provinces are invited to attend the bi-annual meetings, although only Ontario, Alberta and British Columbia regularly send representatives. The MSAC is used as a mechanism for exposing proposed new or amended regulations to the operators involved. It is also a forum for discussion of all matters of joint interest. It is noteworthy that the Air Administration of DOT does not sponsor a safety forum similar to MSAC. Instead, CATA relies on other co-ordination and consultative mechanisms and instruments such as concept papers and bilateral consultative bodies.

Other Safety Organizations

Aviation

2.33 The International Civil Aviation Organization - Canada, through CATA is a Contracting State to this organization. Article 44 of the ICAO Convention states that the role and objectives of ICAO, as they pertain to aviation safety, are to develop the principles and techniques of international air navigation so as to: ensure the safety and orderly growth of international civil aviation throughout the world; encourage the arts of aircraft design and operation for peaceful purposes; encourage the development of airways, airports and air navigation facilities for international civil aviation; meet the needs of the peoples of the world for safe air transport; promote safety of flight in international air navigation; and promote generally the development of all aspects of international civil aeronautics.

2.34 The United States Federal Aviation Administration (FAA) - the FAA is organized and structured basically like CATA, to serve the role, responsibilities and safety objectives of the air transportation system. The FAA and CATA maintain a close liaison in all civil aeronautical matters since the air space and aviation systems of Canada and the USA are not mutually exclusive. Unlike CATA, the FAA caters to aeronautics beyond transportation inasmuch as it has Washington and regional offices which handle general aviation safety matters such as those for recreational flying.

2.35 Private Sector Aviation - The larger Canadian and foreign air carriers and private business operators such as Air Canada, American Airlines and Dome Petroleum all have comprehensive and active flight safety programs which have an effect on the achievement of SAR prevention objectives. These programs conform to and, in many cases, exceed ICAO and CATA safety standards and recommended practices. These organizations, like the pilot unions which counterpoise their management, are ably supported by strong associations such as the Air Transport Association of Canada and the Canadian Business Aircraft Association. These associations, in turn, have capable and active safety committees made up of experts selected from member organizations. These committees on occasion have produced concept and position papers which address SAR prevention matters.

2.36 To a lesser degree, private and small commercial owners and operators in Canada have formed associations, councils and member safety committees. On safety matters the more progressive of these groups are the Royal Canadian Flying Club Association (RCFCA), Flying Farmers and the B.C. and Alberta Aviation Councils. The Canadian Owners and Pilots Association (COPA) representing the large majority of the client population (20,000), does not focus on safety and SAR prevention to the same degree as the foregoing groups.

2.37 Finally, the aviation insurance industry of Canada while generally not directly involved in safety and SAR prevention, denies insurance coverage when an owner has demonstrated consistently unacceptable safety performance. Of interest is the recent initiative of a major Canadian aviation insurance broker (Reed Stenhouse) which has instituted a safety evaluation for commercial helicopter base operators before granting insurance coverage.

Marine

2.38 Inter-Governmental Maritime Consultative Organization (IMCO) - The aim of IMCO is to provide machinery for co-operation among governments on technical matters affecting international merchant shipping. With special responsibility for the safety of life at sea, it tries to ensure that the highest possible standards of safe and efficient navigation are achieved, acts to prevent pollution caused by ships and other craft operating in the marine environment and encourages removal of hindrances to international shipping. IMCO is responsible for covering international maritime conferences and drafting international maritime conventions. (Reference: Yearbook of International Organizations.)

2.39 Also, IMCO has sponsored The International Convention for the Safety of Life At Sea, of which Canada is a contracting state. SOLAS is a comprehensive international agreement of uniform principles and rules established to promote safety of life at sea. This document addresses a wide range of regulations concerning vessel construction, navigation safety, life-saving appliances, communications, carriage of dangerous goods and nuclear vessels.

2.40 In addition to SOLAS, IMCO sponsors other conferences and conventions for the establishment of international standards and practices related to Search and Rescue.

2.41 The Canadian Power Squadrons (CPS) - The Canadian Power Squadrons Organization has the primary objective of increasing the knowledge of boating enthusiasts in all aspects of seamanship, boat handling and navigation by delivering a carefully developed series of classroom courses. In brief, the Canadian Power Squadrons is a nation-wide association of Canadians interested or active in boating. The national organization is a confederation of local squadrons extending from the Atlantic to the Pacific.

2.42 CPS maintains that it is not a safety organization as such, but produces a set of standards for its members that ensure the safe operation of boats. During the last teaching season, the CPS gave courses to approximately 12,000 boaters, about 8,500 of whom took the basic boating course. The Canadian Power Squadrons has seen a steady growth of approximately 8% in attendance at these courses over the last five years.

2.43 CPS has established a structured set of standards in boating knowledge and education that is available to everyone upon successful completion of a basic course. The Canadian Power Squadrons are represented on the Marine Safety Advisory Council. CPS does not provide organized practical training.

2.44 The Canadian Yachting Association - The Canadian Yachting Association (CYA) is the National Sailing Authority which serves and provides for over 600 yacht clubs, 60 sailing associations and schools, 150,000 racing enthusiasts and more than 1,000,000 recreational sailors across Canada.

2.45 The CYA provides practical instruction in the delivery of their programs, and parallels the Canadian Power Squadron in many ways. Most significantly, it has established a series of standards that can be achieved through education and training. The CYA is also represented on the Marine Safety Advisory Council.

2.46 The Canadian Red Cross Society - The Canadian Red Cross has a wide range of programs that have the goal of preventing distress. In particular, the Red Cross operates a program of Safety Services which includes First Aid, Water Safety and Small Craft Safety components.

2.47 The Red Cross is organized provincially in Canada and each provincial group has a high degree of autonomy in delivering the various Small Craft Safety programs. There are basically two activities undertaken in the provinces: the operation of mobile safety units, which are similar to Coast Guard BOSDET units and an education/awards program related to small boat safety.

2.48 Private Sector Associations - Almost every private sector association formed to address a common marine interest has the safety of its members as a prime concern. Such associations include fishermen's unions and fishery management associations, marina associations, recreational organizations and local marine volunteer groups. These associations are numerous and diverse in both purpose and geography but almost universally exhibit keen interest in safe boating operations.

Special Issue

2.49 Commission of Inquiry on Aviation Safety by the Honourable Mr. Justice Charles L. Dubin - The extent of public concern for safety in air transportation was demonstrated by the Minister of Transport, pursuant to an Order-in-Council of August 3, 1979, appointing Mr. Justice Charles L. Dubin a Commissioner under the Enquiries Act to investigate and report on aviation safety in Canada. The expressed areas of concern for Mr. Justice Dubin's inquiry were:

a) the adequacy of federal law, regulations and rules and of practices and procedures governing aviation safety in Canada, particularly in relation to (i) small aircraft, (ii) remote areas, and (iii) uncontrolled airports;

b) the sufficiency of enforcement of existing aviation safety legislation and standards including the training, qualifications and numbers of federal inspectors;

c) The airworthiness and maintenance of aircraft including departmental aircraft; and

d) the adequacy of aviation incident reporting and investigation and aviation accident investigation.

2.50 These expressed areas of concern cut across the sub-activities of this evaluation of aviation SAR prevention, i.e. investigation, regulation, enforcement, and promotion/education. The outcome of these inquiries will have a significant impact on the performance of safety activities conducted by CATA and, in turn, the achievement of SAR prevention objectives.

2.51 During the course of Mr. Justice Dubin's inquiry, the Ministry of Transport requested him to give priority to the question of accident and incident investigation and reporting. Accordingly, Volume I of the Dubin Report addresses this matter and was presented to the Minister on May 27, 1981. Reports of findings and recommendations on the other aspects of the inquiry are anticipated in the fall of 1981. It is anticipated that Mr. Justice Dubin will highlight many of the problem areas respecting aviation SAR prevention that will be profiled and analyzed in Sections 3 and 4 in this Part of the evaluation report.

2.52 This Part and Part V which follows, provide a descriptive profile of current aviation and marine SAR prevention related safety activities. They summarize Team observations on the level, quality and effects of these activities in achieving the SAR prevention sub-objectives stated previously. Also Sections 3 and 5 identify potential aviation and marine target populations to which SAR prevention measures should be directed on a priority basis.

General Observations

2.53 This overview of SAR prevention produces the following general observations:

(1) There are many organizations in Canada involved in aviation and marine safety, ranging from the federal government to the insurance industry. No evidence could be found that any one of these organizations was explicitly involved in SAR prevention. This suggests that some means of raising the SAR prevention consciousness of these organizations should be found and that appropriate national and regional co-ordinating mechanisms should be established possibly along the lines of the Marine Safety Advisory Council.

(2) It is clear from the role and objectives of ICAO, IMCO and DOT that the efforts of these organizations are directed primarily at achieving safe and efficient movement of international and national commercial transportation, rather than focusing on the safety and SAR prevention needs of other aviation and marine clients such as recreational flyers and boaters.

Conclusions

2.54

(a) Encouraging co-ordination of private organization involvement in federal SAR prevention efforts could result in a more effective national program as well as contributing to increased public consciousness of SAR prevention and operations objectives. Such co-ordination and involvement could be achieved through a national and regional SAR advisory councils.

(b) Priorities and measures to ensure safety are set in the context of overall safety objectives. The mix of measures and emphasis required to minimize SAR incidents can differ from that required to minimize air and marine accidents. Thus SAR priorities to improve aviation and marine safety may also be quite different.

(c) The Team is of the view that it would not be economical to establish SAR prevention programs separately from existing safety programs. Thus, there is a need to consider how safety programs may be influenced, whether costs of changes or additions should be attributed to the SAR program, and how SAR planners should be involved. To this end the Team has defined the activities, tasks, levels of effort and measures required to influence safety programs (see Table 7-1).

SECTION 3 - AVIATION SAR PREVENTION - TARGET POPULATIONS

General

3.1 The analysis in this Section identifies aviation target populations at which stronger SAR prevention measures could be directed in order to reduce the number, severity and costs of SAR incidents.

3.2 As previously noted in Part II of this evaluation, there is a general lack of content and precision in the information contained in existing DND SAR statistics which precludes proper analysis and the derivation of positive, useful indicators, particularly for identifying and describing those involved in aviation SAR distress incidents. Alternatively, it was found that the CATA Aviation Safety Bureau investigation organization maintains detailed case files and assessments of civil aircraft accidents involving SAR which can be used to identify a sample target population. CATA does not maintain case files or statistics on military aviation accidents and incidents, nor civil aviation incidents including those involving SAR.

Analysis of Aviation SAR Distress Incidents/Related Accidents - a Case Study

3.3 The summaries and observations to follow were drawn from 323 CATA civil aviation accident investigation files in which a SAR response was reported. These SAR related accidents covering the years 1976 to 1980 inclusive, amount to approximately 40% of the reported aviation SAR distress incidents (A1 and A2) shown in pertinent Tables of Part II - SAR Program Profile. Also, these accidents amount to about 9% of the approximately 3,500 civil aircraft accidents which occurred in Canada between 1976 and 1980 inclusive. The remaining 91% apparently did not involve SAR.

3.4 Accordingly, the five tables shown next, together with their accompanying explanatory notes and additional information, summarize details of SAR-related civil aviation accidents occurring in Canada from 1976 to 1980 inclusive. The data and information for these tables were drawn from CATA Aviation Safety Bureau case files and computer printouts as reported up to April 20, 1981. Significant contributing factors causing these SAR-related accidents were shown previously in Part II, table 3-11c.

TABLE 3-1

SUMMARY OF CIVIL AVIATION SAR RELATED ACCIDENTS

1976-1980

	AREA OF OCCURRENCE[1]												
YEAR	B.C.	ALTA	SASK	MAN	ONT	QUE	N.B.	N.S.	NFLD	YUKON	N.W.T.	TOTAL	%
1976	26	7	6	1	16	11	-	1	1	4	4	77	24
1977	20	8	3	4	16	13	1	1	4	1	2	73	23
1978	27	7	2	5	12	8	-	1	5	1	4	72	22
1979	12	11	1	2	15	10	1	3	4	1	1	61	19
1980[2]	3	4	3	-	11	9	3	-	3	2	2	40	12
TOTAL	88	37	15	12	70	51	5	6	17	9	13	323[3]	
%	27	11	5	4	22	16	1	2	5	3	4		100

Explanatory Notes

1) No occurrences in PEI.
2) Approximately 5 SAR related accident investigation reports are still to be completed and recorded by CATA for 1980.
3) 11 aircraft are still missing and have been reported as accidents.

Additional Information

a) These accidents resulted in 430 fatalities or presumed dead, 103 seriously injured, 106 with minor injuries and 218 uninjured - Total-857.
b) Coroner reports and assessments made by CATA medical officials indicate that the large majority of fatalities occurred on impact with possibly 5% surviving for a short period after the accident.
c) Approximately 73% (236) of all accidents occurred enroute, 18% (57) occurred on approach and landing and 9% (30) after takeoff.
d) US registered aircraft accounted for 33 (10%) of the 323 SAR related accidents with 16 U.S. accidents occurring in B.C. and 9 in Ontario. The remainder occurred in Alberta (2), Saskatchewan (1), Yukon (1), Quebec (1), New Brunswick (1) and Newfoundland (2).

TABLE 3-2A

SUMMARY OF TYPES OF PILOTS INVOLVED IN SAR RELATED ACCIDENTS

1976-1980

	AREA OF OCCURRENCE[1]												
PILOT TYPES	B.C.	ALTA	SASK	MAN	ONT	QUE	N.S.	N.B.	NFLD	YUKON	N.W.T.	TOTAL	%
Student	1	1	-	-	3	1	-	-	-	-	-	6	2
Private	39	17	6	7	37	28	3	1	3	4	1	146	45
Commercial	33	11	4	3	19	10	1	3	8	2	4	98	30
Sr Commercial	1	1	-	-	3	1	1	-	1	-	1	9	3
Airline Transp.	6	3	2	2	4	7	-	1	3	1	4	33	10
Helicopter	7	4	3	-	1	4	-	-	2	2	3	26	8
None & Glider	1	-	-	-	3	1	1	-	-	-	-	5	2
Total Pilots and Accidents	88	37	15	12	70	51	6	5	17	9	13	323	100%

Explanatory Notes

1) No occurrences in PEI.

Additional Information

- Of the pilots involved in these accidents, there were no repeaters.

TABLE 3-2B

SUMMARY OF PILOT EXPERIENCE IN FLYING HOURS

1976-80

PILOT TYPES	TOTAL HOURS FLOWN					TOTAL HOURS ON TYPE					HOURS ON TYPE IN LAST 90 DAYS			
	0 500	500 1,000	1,000 5,000	5,000+	No. of Pilots	0 100	100 500	500 1,000	1,000+	No. of Pilots	0 50	50 100	100	No. of Pilots
Student	6	–	–	–	6	5	1		–	6	6	–	–	6
Private	97	21	15	3	136	70	48	11	3	132	97	15	5	117
Commercial	10	21	47	18	96	21	33	18	18	90	25	21	35	81
Sr. Commercial	–	–	6	3	9	3	3	–	1	7	6	1	2	9
Airline Transp.	–	–	14	19	33	3	14	3	10	30	11	5	11	27
Helicopter	2	3	17	4	26	4	11	6	6	27	10	3	14	27
None & Glider	5	–	–	–	5	5	–	–	–	5	4	–	–	4
Total Pilots	120	45	99	47	311	111	110	38	38	297	159	45	67	271

Additional Information

- 10% (33) of these pilots were U.S. licensed pilots of which 31 had private pilot licences.

TABLE 3-3

SUMMARY OF AIRCRAFT INVOLVED IN SAR RELATED ACCIDENTS

1976-1980

Manufacturer	Fixed Wing					Glider	Helicopter				TOTAL	%
	Single Engine		Twin Engine				Single Engine		Twin Engine			
	A	B	A	B	C		A	D	A	D		
Beech	7		5	3							15	4
Bell							11	19		2	32	10
Cessna	119		6								125	39
de Havilland	20			8							28	9
Sikorsky							1	3			4	1
Hughes								6			6	2
Piper	55		13								68	21
Other	32		5	1	1	1	3	2			45	14
TOTAL AIRCRAFT	233 72%		29 9%	12 4%	1	1 1%	15 5%	30 9%		2 1%	323	100

Types of Engines:

A - Reciprocating
B - Turbo Prop.
C - Turbo Jet
D - Turbo Shaft

TABLE 3-4

SUMMARY OF TYPES OF FLIGHT OPERATIONS INVOLVED IN SAR RELATED ACCIDENTS

1976-1980

	AREA OF OCCURRENCE													
TYPE OF OPERATIONS	B.C.	ALTA	SASK	MAN	ONT	QUE	N.B.	N.S.	PEI	NFLD	YUKON	N.W.T.	TOTAL	
														%
Private Recreational	37	9	2	3	28	23	2	2	-	5	1	1	113	35
Commercial Charter	17	10	8	3	16	10	2	1	-	7	2	9	85	26
Private Business	10	7	3	1	6	-	-	-	-	2	3	-	32	10
Commercial (Special Train)	4	4	1	1	6	3	-	1	-	-	1	-	21	7
Commercial (Special Rec)	3	1	-	2	3	2	-	-	-	-	-	-	11	3
Commercial Non-Revenue	5	1	-	-	2	-	-	-	-	1	-	-	9	3
Flying Club (Rec & Train)	1	2	-	-	4	1	-	2	-	-	-	-	10	3
Others*	11	3	1	2	5	12	1	-	-	2	2	3	42	13
Total Operations and Accidents	88	37	15	12	70	51	5	6	-	17	9	13	323	100%

Explanatory Notes

* Others include: Private Ferry, State, commercial Aerial Photography & Survey, Regular Specific Point, Aerial Application and Distribution, Inspection-Reconn-Advertising, Private-Other, commercial Specific Point, Aerial Control, Aerial Ambulance & Mercy, International Charter, Private Training, Private Aerial Spray.

Additional Information

- 22% of these operations involved pilots who had not filed a flight plan, notification or itinerary; 72% recorded Visual Flight Rule intentions; and 6% filed Instrument Flight Rule plans.
- 35% of all flight operations were private recreational - the number of accidents in this classification has remained constant over the years until 1980 when there was a decrease to 30% with commercial charter operations showing an equivalent increase of 5% to 31% in 1980.

TABLE 3-5

SUMMARY OF BASE OPERATORS[1] INVOLVED IN SAR RELATED ACCIDENTS

1976-1980

CTC LICENSE CLASSIFICATION	B.C.	ALTA	SASK	MAN	ONT	QUE	N.B.	N.S.	NFLD	YUKON	N.W.T.	USA	TOTAL	%
Regular Spec. Point (Class 2) A	3			1	2	1							7	6
Spec. Point (Class 3) B	4	2			2	3			2		1		14	12
Charter Class (4) C	16	9	4	1	17	9	3	1	3	2	3		68	60
Flying Club (Class 6) D	2	2			3		1	1					9	8
Specialty (Class 7) E	3	1		2	5	2					1		14	12
International Charter (Class 9-4)												2	2	2
Total Commer. Base Operators %	28 24	14 12	4 4	4 4	29 25	15 13	4 4	2 2	5 4	2 2	5 5	2 2	114	100%

Explanatory notes

1) Base operator is a person or persons operating an air service that is licensed by the CTC and certified by CATA.

A) One class 2 operator was involved in 3 accidents; one operator was involved in 2 accidents.

B) Two class 3 operators were involved in 2 accidents; one operator was involved in 4 accidents.

C) Six class 4 operators were involved in 2 accidents; two operators were involved in 3 accidents; one operator was involved in 5 accidents (in Saskatchewan); four helicopter operators were involved in 2 accidents; two helicopter operators were involved in 3 accidents; one helicopter operator was involved in 4 accidents.

D) Three flying club operators were involved in 2 accidents.

E) One speciality helicopter operator was involved in 2 accidents.

Additional Information

- 158 (49%) of the 323 accidents were generated by commercial base operators as well as 5 by unlicensed government operators i.e. CATA (3), RCMP (1), and OPP (1). The remaining 160 (50%) of 323 total accidents were generated by private operators who do not require a licence.

Observations

3.5 From Table 3-1, "Summary of Civil Aviation SAR Related Accidents, 1976-1980", it was observed that:

a) The number of annual SAR related accidents has decreased by 48% during the reporting period, indicating that accident and SAR prevention measures may be producing positive effects nationally.

b) Cases occurred chiefly in B.C., Ontario, Québec and Alberta (76%) with B.C. having the highest total number (27%) during the period. However, cases in B.C. have decreased significantly from 34% of the annual total in 1976 to 20% in 1979, indicating that accident and SAR prevention measures may be producing the strongest effect in B.C. compared with other provinces.

c) Over the period examined, 10% of the 323 cases involved US registered private aircraft and pilots, with 50% of these cases occurring in B.C. This indicates a significant US involvement in SAR distress incidents in Canada, particularly in B.C. (see Table 3-1).

From Tables 3-2 to 3-5, it was observed that:

d) Private and commercial licensed pilots were involved in 146 (45%) and 98 (30%) respectively of the 323 SAR related cases. This pilot population flew mainly in B.C. (30%), Ontario (27%) and Québec (16%), indicating that private and commercial licensed pilots flying in these provinces present a prime target population for SAR prevention measures, albeit the annual rate of SAR related accidents is falling significantly in B.C. (see Tables 3-1 and 3-2A).

e) Since most experts consider the number of hours flown is a measure of pilot knowledge and experience, Table 2B shows that private pilots with less than 500 total flying hours and less than 50 hours on the type of aircraft in the last 90 days, have a greater number of SAR related accidents than private pilots with more total and on type flying hour experience. In contrast, the analysis reveals that commercial pilots with more than 1000 total flying hours and those with less than 500 hours on type have more SAR related accidents than commercial pilots with greater or less experience. Also, commercial pilots flying more than 100 hours in the last 90 days have more accidents than others flying less. These distinct differences in target populations in the private and commercial licence groups may require a different mix of SAR prevention measures both within a licence group and between groups (see Table 3-2B).

f) No aircraft with more than two engines was involved in a SAR-related accident during the reporting period and only one accident to a private licensed two engine turbo-fan aircraft was reported (Churchill Falls). The larger commercial carriers and private operators which are equipped with multi-engine turbo-fan and turbo-jet aircraft are not experiencing SAR-related accidents (see Table 3-3).

g) Of the 323 cases, 113 (35%) occurred during private recreational flights and 85 (26%) during commercial charter operations, indicating that those involved in these types of flight operations present a primary target population particularly those located and flying in B.C., Ontario and Québec where 27%, 22% and 17% of the cases took place over the reporting period (see Table 3-4).

h) Of the 114 commercial base operators, 68 (60%) had CTC class 4 charter licences indicating a priority target population. This population was predominantly located in B.C. and Ontario. Of this number, 36 operators had more than one SAR related accident. The most accident prone commercial base operator had been involved in five SAR related accidents over the reporting period, indicating that this company should be treated as a top priority target for the application of SAR prevention measures (see Table 3-5).

Analysis of Aviation SAR Non-Distress Incidents

3.6 Table 3-6 following, summarizes details of aviation non-distress incidents (False Alarms and No Emergency) from 1976 to 1980 inclusive, as drawn from DND SAR statistics.

Observations

3.7 From Table 3-6-A3 Incidents, it was observed that:

a) Of the 8343 false alarms reported, 44% were caused by ELTs, indicating that state-of-the-art ELTs are generally unreliable and wasteful in terms of non-productive SAR work.

b) Of the 8,343 false alarms reported, 44% were caused by overdue aircraft indicating that current in-flight progress and flight termination processes and procedures may be deficient and wasteful in terms of non productive SAR work.

c) Of the remaining 1,015 (12%) false alarms, mostly by radio and visual means, the notifications came from a variety of public and private sources, making it difficult to target SAR prevention measures against them even if this course of action were considered desirable.

TABLE 3-6

AVIATION NON-DISTRESS SAR INCIDENTS - FALSE ALARMS (A3) - NO EMERGENCY (A4)[1]

1976-1980

Source of Alert	EDMONTON		HALIFAX		TRENTON		VICTORIA		TOTAL	
	A3	A4	A3	A4	A3	A4	A3	A4	A3	A4
No Info	15	9	3	1	15	1	6	1	39	12
ELT	809	5	576	-	1012	5	1297	-	3694	10
Overdue	1329	27	853	3	902	10	540	3	3624	43
Visual	15	16	13	11	84	4	151	3	263	34
Radio	28	63	16	1084	59	81	432	31	535	1259
Other	27	11	31	16	39	9	91	1	188	37
TOTAL	2223	131	1492	1115	2111	110	2517	39	8343	1395

Explanatory Notes

1) A-4 SAR incidents involve only temporary distress which terminated without further emergency and which required, at most, monitoring action. These incidents will not be analysed at this time as analysis would require considerably more time than was available for this evaluation.

Additional Information

- Of the 1,775 total ELT activations successfully traced, 1,391 were caused accidentally, with the large majority traced to aircraft on the ground.
- The major cause of A3 overdue alerts was that pilots did not amend or close flight plans, notifications and itineraries with an appropriate agency e.g. CATA.

General Observations

3.8 These observations and descriptive profile lead to the following general observations for the identification of a potential target population for priority application of SAR prevention measures:

a) Over the past five years, 66% of SAR-related accidents occurred in B.C., Ontario and Québec showing that the SAR prevention target population operates primarily in these provinces.

b) Inexperienced private licensed pilots, mainly conducting recreational and business operations, were involved in 45% of SAR-related accidents over the past five years. In contrast, more experienced commercial licensed pilots, mainly conducting charter operations, were involved in approximately 26% for a cumulative total of 71% of the SAR-related accidents.

c) Commercial base operators, particularly those located in B.C. and Ontario, of which approximately 60% were charter operators, were involved in 49% of SAR-related accidents over the past five years.

d) Pilots, operators and owners of US private and charter aircraft were involved in 10% of SAR-related accidents in Canada over the past five years, most notably in B.C. (50%).

e) The ELT was a major source (44%) of SAR false alarms over the past five years, indicating that state-of-the-art ELTs may be unreliable.

f) Overdue aircraft accounted for 44% of SAR false alarms over the past five years indicating that there may be weaknesses in the flight planning, reporting and communications processes between pilots, intermediaries and Rescue Coordination Centre duty controllers.

Conclusion

3.9 An analysis by the Team of the 323 air accidents involving SAR over the years 1976-1980 showed that two-thirds took place in Ontario, Québec and British Columbia. One-half of these accidents involved inexperienced private pilots, and one-quarter were pilots of small commercial charters. Aviation SAR prevention efforts should therefore focus on these classes.

SECTION 4 - ANALYSIS OF AVIATION SAR PREVENTION SUB-ACTIVITIES

Investigating

Objective

4.1 "To determine the causes of all aviation SAR incidents".

Descriptive Profile

SAR Incident Investigations

4.2 SAR incident reports are initiated by DND/RCC's and by DND Search Masters whose findings are reported to civil aviation authorities. These reports follow many formats, ranging from daily telex messages outlining the bare details of a SAR incident to a detailed Search Master's report where the Search Master attempts to establish probable cause(s) of a SAR incident.

4.3 In accordance with the criteria of DND publication CFP 209, all RCCs (Victoria, Edmonton, Trenton and Halifax) send daily telex messages called SITREPs (situation reports) containing a summary of the day's SAR activities to both CATA HQ and the appropriate CATA regional office. These messages are addressed to the Aeronautical Licensing and Inspection Branch (DLI/LIOA) at CATA HQ, which screens them to identify incidents involving domestic and foreign civil aviation and to identify problem areas relating to CATA Regulatory and Air Navigation Activities. After significant events have been reported, the SITREPs are held in DLI/LIOA for approximately one week and are then forwarded to the Aeronautical Policy, Planning, Programming and Development Branch (DPD/PDS). The SITREPs are reviewed again by DPD/PDS to identify significant events relating to SAR including ELTs. The reports are then filed. Also, DLI/LIOA periodically phones RCCs to get more information on particular incidents but does not act as the formal liaison link with DND.

4.4 In the CATA Regions, the Regional Superintendents, Air Regulations who are under the Regional Controller of Civil Aviation, receive copies of the SITREPs and take action they deem appropriate through their enforcement staff.

4.5 Special SAR reports, approximately 60 per year are prepared by DND Search Masters. These Special SAR Reports are normally written when there has been a loss of life, expenditure of over 49 hours search time or when there are other special conditions or considerations. Until recently, DND sent the reports directly to the CATA/DAS, Aviation Safety Promotion Division (DAS/ASP) where they were reviewed and evaluated for aviation safety implications and deficiencies. They are directed by DAS to the office of Civil Aeronautics Implementation Co-ordination (CAII) which prepares a co-ordinated Directorate review and response to DND.

4.6 Reports on UNSARs (unnecessary SAR alerts) are prepared by RCCs and sent by telex message to DLI/LIOA and to the appropriate Regional Controller of Civil Aviation (RCCA) or to the Regional Superintendent, Air

Regulation (RSAR) in the CATA regions. The UNSARs are monitored by DLI/LIOA which reports regularly to the division chief on significant incidents. DLI/LIOA relies on the regional staff to take appropriate action. The UNSAR file and a report of trends are forwarded to the division Chief every six months to monitor action taken and outstanding items.

4.7 SARSTATS (SAR statistics) prepared monthly by the RCCs are sent to CATA by DND HQ on a quarterly basis and (DLJ/LIOA) monitors them to identify significant trends. These statistics are then forwarded to DPD/PDS where they are again reviewed and filed.

4.8 Finally, CAII receives all coroners' inquest reports which result from aircraft accidents or which have a recommendation or finding relating to civil aviation, including those with a SAR implication. CAII co-ordinates an appropriate directorate response based on the expertise of the individual CATA HQ Branches involved, e.g. Coroners' reports which contain SAR related recommendations such as the carriage or operation of ELTs.

Enforcement Investigations

4.9 In relation to CATA's responsibilities, one of DLI's roles has been the detection and investigation of violations of Air Regulations or Air Navigation Orders as reported by DND, policing agencies and internally within CATA. Detection and investigation includes surveillance, detection, gathering all pertinent data, prima facie evidence, witness statements and reporting. These form part of the enforcement process discussed later. SAR incidents are investigated by DLI and RCCAs to determine cause, whether or not there was non-conformity with an aviation rule or regulation, or whether is was a matter of misjudgment or a lack of knowledge. Investigation of these SAR incidents is made as part of the total CATA regulation enforcement process.

Aircraft Accident/Incident Investigations

4.10 The activities of aircraft accident/incident investigation in CATA sometimes parallel those of DND SAR incident analysis but they are not necessarily the same activities nor do they produce the same outputs. The investigation of aircraft accidents depends on whether or not the aircraft sustained "substantial damage or is destroyed", and whether "any persons suffered death or serious injury", in which case an occurrence becomes an accident. If the location of the occurrence is not known, it is both an accident and a SAR incident. Aviation SAR incident investigations address those happenings where the location of an aircraft is not known and there is a possibility of death, injury or substantial damage, or where there is no injury or damage, e.g. forced landings. CATA accident investigation specialists currently do not investigate SAR incidents which are not accidents.

4.11 The CATA Aviation Safety Bureau Branch (DAS) is directly involved in the investigation of SAR incidents involving civil aircraft accidents, including missing aircraft. Search, survival and rescue per se are not specifically included in the DAS mandate but are implicit in the absence of any other identified functional OPI within CATA. The accident investigation reports prepared by DAS/ASE personnel from HQ and by Regional Superintendents, Accident Investigation (RSAI) who are under the RCCA, cover a very detailed examination of all pertinent facts ranging through personnel identification, aircraft identification, history of the flight, accident site, meteorological information, wreckage and impact information and other details necessary for a complete analysis of the occurrence. Information specifically pertaining to SAR is on page 14 of the accident report which covers "Survival Data", and on page 16, which addresses "Search" under the sub-headings of "found by - search by - locating method - and elapsed time". ELT performance and other descriptive data are also included on this page.

Linkage of Investigation Activities

4.12 The relationship between DAS accident and DLI enforcement investigation restricts both types of investigations. Accident investigators may indicate a perception that certain violations were factors in an accident. Such information is then passed to the enforcement specialist for appropriate action. The present system maintains the confidentiality of information required by the accident investigator insofar as he and policy can dictate. The enforcement specialist, on the other hand, can begin his own investigation based on raw information from many sources, including person(s) involved in a particular accident, the aircraft identification, time and location. CATA management stated that the present procedure is workable and adequate. In balance, CATA enforcement specialists stated that, in most cases, it is difficult to use contributing cause factors assigned by accident investigators to prove violations of regulations since accident investigations are not concerned with assigning blame.

Other Investigations

4.13 Only the larger commercial companies and private flying club associations such as Air Canada, Okanagan Helicopters and the Royal Canadian Flying Club Association participate in or monitor CATA accident investigations. Like DND and CATA, their management conducts independent internal administrative investigations to establish cause and blame and to enforce punitive actions on employees or members if they are found at fault.

4.14 The larger employee unions such as CALPA sometimes conduct independent aircraft accident/incident investigations to protect their members from undue criticism by the federal government or private sector management.

4.15 Aviation insurance company claim adjustors independently investigate civil aircraft accidents to establish blame and to ensure that the provisions of the particular policy have been followed. It was noted that claims for hull damage are usually settled without question but liability and property damage claims often go to litigation. Insurance underwriters do not investigate SAR incidents not involving accidents as Canadian aviation insurance policies do not contain a SAR provision.

Dubin Commission - Volume I

4.16 Creation of a Canadian Aviation Safety Board - The major recommendation of Volume I of the Dubin Commission is for the creation of a Canadian Aviation Safety Board (CASB) to report to Parliament through other than the Minister of Transport. The Minister has subsequently announced that Cabinet endorses this recommendation and has initiated administrative and legislative action for the creation of such a Board, for presentation early in the next session of Parliament (October 1981). No decision has as yet been made on whether or not this Board should address multi-modal accident investigations. Also, the matter of this Board investigating SAR incidents has not so far been addressed by the federal government or by Mr. Justice Dubin.

Observations

4.17 With respect to the outputs and effects of this activity, it was observed that:

a) CATA officials receive DND daily SAR incident, unnecessary SAR (UNSAR) and Special SAR reports as well as DND quarterly SAR statistics. However, little could be found to indicate that these reports are thoroughly analyzed or consistently acted upon by managers either at CATA Headquarters or at the six regional CATA offices.

b) CATA officials seldom inform DND regional SAR managers about actions taken on DND SAR report findings and recommendations, particularly those where a clear violation of Aeronautics Act regulations and orders was committed. A recent exchange of correspondence between these departments on the closing of flight plans (Annex IV-I) indicates this situation may be improving.

c) Although of a high general calibre, CATA aircraft accident investigation reports involving SAR do not contain information as to whether survival equipment was carried. Also, it was observed that several CATA regional investigation units do not complete the ELT carriage and performance section of accident reports.

d) DND assessments of the causes of SAR incidents were observed to be generally incomplete in scope and content, as explained in the analysis of DND aviation SAR incident statistics in Part II. In particular, it was noted that DND identifies virtually no root causes for false alarms and non distress alerts (A3 and A4).

e) CATA accident investigation officials apparently have not offered, nor have they been requested by ICSAR to provide, their analysis and findings on SAR-related accidents.

f) CATA, DND and private sector organizations do not formally coordinate or consult on their respective accident/incident findings and recommendations. Also, it was observed that there are no national or regional forums for exchange of this information between participating public and private sector organizations. Each organization has its own degree of confidentiality and publishes its own material which generally is not available for the benefit of the client and more importantly for the target population.

General Observations

4.18 These observations and descriptive profile lead to the following general observations on the achievement of the investigating objective of SAR prevention:

a) DND forwards its SAR reports on civil aviation occurrences to a variety of offices in CATA Headquarters but there is no central co-ordinating authority responsible for monitoring, analyzing or implementing these DND findings and recommendations. This indicates that CATA is not organized to handle SAR prevention matters in a satisfactory manner.

b) CATA does not generally provide ICSAR with the findings and recommendations with SAR prevention implications from its enforcement and accident investigations nor has ICSAR requested these reports. This policy and planning committee is thus deprived of a valuable source of expertise and information for establishing the root causes of SAR incidents and for recommending appropriate SAR prevention measures for application to civil aviation in Canada.

c) In view of the impending establishment of the Canadian Aviation Safety Board (CASB) and the apparent divided and unco-ordinated nature of the federal government organization and process for investigating SAR incidents, placing this function in the proposed CASB merits consideration. Alternatively, investigation findings and recommendations on SAR prevention, produced by either the public or private sector of the aviation community in Canada, should be tabled and discussed by all interested parties through national and regional aviation SAR prevention councils.

Conclusions

4.19 The Team concludes that there should be better co-ordination of SAR related accident and incident investigations and reports between DND and CATA and within CATA. The Team also believes that wider publicity of the results of SAR accident investigations would increase public awareness of SAR incident causes and consequences.

Regulating Objective

4.20 "To provide essential SAR prevention standards for aircraft, equipment and personnel including personnel survival standards."

Descriptive Profile

Aeronautical Standards and Regulations

4.21 SAR, with no single identifiable office of responsibility within CATA, has evolved in the legislative field as an integral part of needs identified by the operating branches of CATA, which individually have assumed SAR responsibilities. Accordingly, the regulations, standards and practices developed and maintained by CATA DSL in response to operational needs include SAR matters of varying degrees.

4.22 Aeronautics Act Task Force - One of the major initiatives which addresses critical aspects of CATA's safety responsibilities is the Aeronautics Act Task Force (Legislative Review Branch). This Task Force, over the past three years, has undertaken a substantive review of the Aeronautics Act and subordinate legislation with the intent of improving its currency and enforceability. The objective of the Task Force is to devise methods of regulating civil aviation which are founded in law and yet provide an effective means of regulating civil aviation while avoiding unwarranted burdens on the aviation industry. In addition to revising the enabling legislation, the Aeronautics Act, the Task Force is developing comprehensive schemes for civil aviation legislation which requires the consent of the aviation community and parliamentary approval. In general terms, the Task Force is developing and implementing legislative policy and operational procedures for the control of commercial and private air transport in Canada.

4.23 The following is the current status (July 31, 1981) of the policy/procedural projects undertaken by the Task Force which affect the SAR prevention regulating activity and other SAR prevention activities.

a) Concept Paper No. 14, CATA's Compliance Program - DOT Management Services was commissioned to examine all considerations arising from a broad public consultation and to put together a CATA Compliance Position. This has been completed and basically it supports the DLR concept paper. It has also been reviewed by DGCA and is currently tabled with the AATA.

b) Working Groups on Personnel Licensing - the work of this group is divided into two phases i.e. Flight Crew and Other Than Flight Crew. The final draft of the total project is 47% complete.

c) Working Group on Airworthiness - the substantive review is 70% complete, final draft target date is December 1982.

d) Working Group on Aeronautical Information - technical draft and initial consultation is 80% complete; project is currently held pending a decision on format.

e) Working Group on Air Operations, Pre and Post Flight - technical draft and initial consultation is 55% complete; requires co-ordinating meeting with Working Groups on Airworthiness and Operating Rules before proceeding.

f) Working Group on Operating Rules - technical draft and initial consultation is 61%* complete as follows:
  - Division 1, General 90% (2nd draft)
  - Division 2, VFR 95% (2nd draft)
  - Division 3, IFR 85% (1st draft)

4.24 It is anticipated that the work of the Task Force will be completed in approximately 2 years and that implementation of its recommendations will have a positive impact on SAR prevention.

Regulatory Components

General

4.25 There are two safety regulating activity components whose outputs affect the achievement of the objective of regulatory SAR prevention activity. The first component relates to personnel and aircraft regulations, orders, directives and instructions and their accompanying standards and practices promulgated by both public and private sector organizations, most notably by CATA. The second component pertains to regulatory measures on personnel survival including personnel location measures after the occurrence of a SAR incident.

Personnel and Aircraft Regulation

4.26 The predominant regulatory arm of CATA at present is the Aeronautical Licensing and Inspection Branch (DLI) whose function is to ensure that all aviation personnel in Canada are adequately qualified and licensed to ensure a high level of aviation safety, through compliance with air regulations and air navigation orders. This function of applying and evaluating the air regulations is extended to prevent accidents and hence a reduction in SAR incidents. Specifically, DLI develops and implements policy, procedures and standards for all aviation personnel licensing. This includes establishing and verifying Canadian flight training standards for all types of civil aviation licences; conducting training of designated flight test examiners; developing and implementing a national training program for civil aviation inspectors; applying legislative standards to domestic and international air carrier operations in Canada; issuing, amending, suspending or cancelling the operating authority for foreign and domestic air carriers in Canada; conducting audits and inspections of air carriers; and establishing standards for and regulating an airline passenger safety program.

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* reduced % reflects work completed on second draft at this stage.

4.27 The Airworthiness Branch (DAB) is accountable technically for all airworthiness matters governing the manufacture, maintenance, design and continuing safety, of all aeronautical products either used in or manufactured in Canada. Their responsibility includes 20,000 registered aircraft in Canada, 700 Canadian designed and manufactured aircraft and 10,000 aircraft engines exported to over 75 countries. Until mid-1980, the DAB branch was a part of the DLI branch. Its primary function is therefore inspection, licensing and certification as it applies to the airframe and all component parts of the aircraft and to those who manufacture and maintain aircraft.

Observations

4.28 For the outputs and effects of this component, it was observed that:

a) Evidence pertaining to CATA regulation of aircraft and their on board systems are to be reported by the ongoing Dubin Commission whose final two reports are expected later in 1981.

b) CATA outputs for training and licensing of Canadian private and commercial pilots revealed deficiencies which the Team considered worthy of mention despite possible duplication in Dubin Commission findings. Specifically, it was observed that:

i) ground school instructors who are responsible for educating embryo private and commercial pilots are not checked or certified by CATA although they teach subjects where thorough knowledge is judged essential for the safe conduct of operations;

ii) weather training for pilots is governed by the standards set by CATA in the Personnel Licensing Handbook and detailed in the appropriate Study and Reference Guide. As the aircrew level of licence requirement increases, i.e. Private Pilot through to Airline Transport Pilot, the demands of pilot knowledge of weather and its effects on air navigation increases. These knowledge demands are subject to examination at the appropriate licence level, but are not re-examined as an audit of currency;

iii) it is possible at this time to fail the meteorology (weather) portion and still pass the CATA private pilot licence ground examination even though weather factors are one of the major contributing causes of SAR incidents;

iv) CATA ground examination questions and answers are generally known by student pilots before they sit for an examination. It was noted that CATA/DLI is considering using a large bank of questions that will be randomly selected for each examination. This new approach will match that of the FAA for US student pilots;

v) designated flight test examiners and flying instructors are checked on a regular basis by CATA after the examiner or instructor has been rated, indicating that CATA is concerned over the qualifications and proficiency of these key quality control personnel;

vi) experts judged certain private and commercial pilot licensing standards for enroute visual flight set by CATA to be unsatisfactory, particularly those pertaining to flight in areas of rugged terrain and/or unstable or severe weather conditions, such as those experienced by pilots operating in B.C., Yukon, N.W.T., western Alberta and in the remote northern areas of several other provinces;

vii) unlike US FAA and the RCFCA, CATA has no sponsored proficiency grading system for private and commercial pilots. Also unlike the US FAA, CATA does not require a bi-annual ground examination for Canadian private and commercial pilots after which they would be retrained and retested if they failed to pass.

General Observations

4.29 These observations and descriptive profile lead to the following general observations concerning the personnel and aircraft regulating activity:

a) CATA qualification standards were found lacking for ground school instructors. Private and commercial pilot examination passing standards, particularly in aviation weather, as well as subsequent periodic retesting of air knowledge and flying proficiency are too low. In addition, it was observed that CATA private pilot licence standards are faulty in permitting these pilots to fly visually in mountainous and sparsely settled areas without appropriate training and experience.

b) CATA management recognizes that existing legislation, regulations and orders pertaining to civil aviation lack currency and enforceability. The Aeronautics Act Task Force will soon be submitting recommendations which should improve the current legislation for effecting safe control and regulation of commercial and private air transport in Canada. It is to be hoped that, in this context CATA senior management will take into full consideration the objectives and concerns of SAR prevention as expressed in this evaluation report and by other ICSAR members.

Conclusions

4.30 Ground school instructors are not certified or checked by CATA although they provide knowledge essential to safe operations. It was also concluded that it is possible to obtain a private pilot's licence even if the meteorology portion of the ground examination is failed. Government and private sector safety experts interviewed were of the view that standards for maintaining private and commercial pilot licences and for visual flight into mountainous and sparsely settled areas are inadequate. Expert opinion and the Team's judgement is that standards should be raised in these areas.

Descriptive Profile

Personnel Survival Regulation

4.31 Personnel survival regulatory measures provided by CATA are outlined in detail in the paragraphs to follow.

4.32 Alerting: A specific and directly SAR related air regulation is Air Navigation Order Series V-4 pertaining to flight planning and notification procedures. These procedures are designed to ensure a pilot plans and prepares his trip and that others are aware of his plans. The procedures also prevent unnecessary SAR alerts and searches by ensuring pilots report arrival at their destination. They also serve to initiate SAR alerting action when aircraft fail to arrive at planned positions at expected times.

4.33 Surviving: Air Navigation Order, Series V 12, Sparsely Settled Areas, is specifically for SAR purposes in that it is directed at the requirement to carry radio, emergency and survival equipment when flying in specified geographic areas of Canada. This equipment is needed to assist aircraft occupants in distress in surviving, pending the arrival of SAR resources. DAS has in the past conducted studies to amend the survival kit specifications for adequacy under Canadian climatic conditions and has made informal arrangements with the DND survival training school to evaluate the specified equipment for civil aircraft under those conditions. In addition, DAS has assisted in the survival training programs for employees of federal government departments and for civil aviation clients. DAS has completed preparatory work on the development of a Canadian survival manual for civil aviation which would be suitable for CATA endorsement.

4.34 Locating - Emergency Locator Transmitters (ELT): The ELT is an electronic communications device designed to assist in the rapid detection and location of aircraft accidents and aircraft in distress. An effective ELT operation reduces the time and resources needed in detecting the distress situation and in rapidly locating the incident site by airborne VHF/DF. ELT in themselves do not reduce the incidence of SAR, but rather they reduce the expenditure of the SAR resource in searching and effecting rescue. With the advent of SARSAT, orbitting surveillance satellites have the potential to detect rapidly and locate the ELT transmission within 10 n.m. thus reducing the SAR resource utilization to an even greater extent.

4.35 ANO Series II-17, Order Respecting the Carriage of ELTs, Current Status - August 25, 1981 - The Air Navigation Order, Series II, No. 17, (June 27, 1977), requires certain Canadian registered aircraft to carry Emergency Locator Transmitters, type approved in accordance with RSS147 Issue 2 (April 1, 1970) or Issue 3 (July 31, 1974).

4.36 Airworthiness Directive CF-78-01 ordered the removal of all lithium battery powered ELTs from Canadian registered aircraft and provided for their reinstallation when powered with non-lithium batteries. Schedules of this AD allowed for the fitting of non-lithium batteries from an approved ELT manufacturer and for the fitting of owner manufactured battery packs as an interim measure.

4.37 Subsequently, in 1978, a waiver to Section 3 of the ANO was issued relieving the requirement to carry ELTs. For some operators, this waiver was reissued in 1979, 1980 and 1981 with the current waiver expiring on December 31, 1981.

4.38 Over this period CATA has addressed many legal, technical and administrative problems associated with the above orders, directives and standards. The relationship of these problems to the SAR system and particularly to obtaining the greatest possible carriage for the forthcoming SARSAT demonstration and evaluation are evident.

4.39 The following are recent CATA actions and intentions with respect to this ANO:

a) On October 2, 1981, the Minister signed an Order revoking the present ANO as of December 31, 1981, and substituting a new ANO Series II, - 17 effective April 1, 1982. the new ANO requires, as of its effective date, the carriage of ELTs which meet technical standards promulgated in the Engineering and Inspection Manual on August 1, 1981. The Engineering and Inspection Manual amendments have been printed and are ready for distribution. This amendment includes ELT standards of performance, testing, installation and maintenance and special procedures for ELTs which formerly were powered by lithium batteries.

b) The Notice to Aircraft Maintenance Engineers and Aircraft Owners (NAME-AO) is prepared subject to the above date revision and it is proposed to distribute it to owners and engineers by the end of September 1981.

4.40 Ad Hoc TC Committee on Locator Transmitter Management - In response to the ICSAR request of February 9, 1981 that TC accept management responsibility for the entire Locator Transmitter project, representatives of CMTA, CATA and ADMC met on June 19, 1981 and formed this Ad Hoc Committee. It was agreed that CATA is responsible now and will continue to accept responsibility for the ELT program i.e. the carriage policy, the development of legislation related to carriage policy, and the regulatory and inspection functions associated with ELT carriage. It was also agreed that the Coast Guard is responsible now, and will continue to accept responsibility, for the EPIRB program i.e. the carriage policy legislation and regulatory and inspection functions associated with EPIRB carriage. DND has the responsibility to co-ordinate all SAR operations and to conduct airborne

SAR operations, supported by the Coast Guard conducting marine SAR operations and the SAR alerting and communications functions performed by both CCG and CATA.

4.41 SAR operation related to persons lost in bush and wilderness areas was identified as the responsibility of local and provincial police forces i.e., the Attorney General's Department of each province. This TC Committee addressed the question of which agency is responsible for ensuring that the personal locator beacon (PLB), the outstanding portion of the total LT picture, has a carriage policy and enabling legislation. Furthermore, the Committee considered who should assume this role for the entire LT project. It would be in the self-interest of DOT to ensure that the operation of PLB's should not have a negative impact on the ELT, EPIRB and SARSAT programs.

4.42 DOT senior management noted that there is a lack of available definitive information and agreed to ask the Director General of Management Systems to develop a position paper in co-ordination with ADMC that would:

a) identify the issues;
b) indicate the views of the various DOT components on these issues;
c) determine if possible the appropriate level of DOT involvement in the management of the LT program.

4.43 The Committee will review and discuss the position paper when developed, and will make a presentation to Transport Management Committee. Subsequently, a formal response would be made to ICSAR as to whether or not DOT would accept responsibility for the management of the total LT project.

4.44 Revisions to Annex 12, Appendix A to the Convention on International Civil Aviation - The International Civil Aviation Organization is currently developing a revised schedule of the SAR signals in Appendix A to Annex 12 International Standards and Recommended Practices for SAR. This schedule contains visual and other SAR signals for surface craft, ground to air and air to ground. It is intended to condense the number of signals used for SAR purposes. ICAO is currently consulting with CATA on these revisions but is contemplating no other changes to Annex 12 at this time.

Observations

4.45 For this regulatory activity component, it was observed that:

Alerting

a) Some experts considered CATA ANO V-4, respecting standards and procedures for VFR flight plans, flight notifications and flight itineraries lacking in that the flight notification process leaves SAR alerting action in the hands of a "responsible person" who in some cases cannot be relied upon or held legally accountable to initiate SAR action, for example those not employed in the movement of air traffic.

b) CATA ANO V-6 which describes and specifies distress and urgency signals and frequences, currently does not mention the international distress frequencies as shown in ANO V-27 respecting the requirements for 121.5 MHZ. Work now is underway in CATA to correct this deficiency.

Surviving

c) CATA ANO V-12, respecting the carriage of emergency survival equipment and radio communications systems for flight in sparsely settled areas of Canada, was generally considered by experts to be lacking in scope. In particular, they judged the demarcation line between sparsely populated and populated areas of Canada to be improperly placed, particularly for flights in winter. For example, areas designated by CATA as settled include many of the northern and central parts of provinces which are sparsely settled and which have severe seasonal climatic and environmental effects that could seriously degrade chances of personnel survival in the event of an aviation SAR incident. Finally, it was noted that the blanket radio carriage exemptions granted by CATA in this ANO (Section 5(2)) dilute its efficacy and make it difficult to enforce.

d) CATA ground training and examination requirements for all types of flight crews do not cover personnel survival measures including equipment, SAR signals or examination of the consequences of improper flight planning and preparation.

e) The President of the Canadian Air Line Flight Attendants Association (CALFAA) was most concerned that CALFAA members are not adequately trained in survival measures.

Locating

f) CATA handling of locator transmitter issues was roundly criticized by most experts interviewed. This observation also is stated in evidence presented to the Dubin Commission and in ICSAR minutes. Generally, the main focus of criticism was on the scope and content of the currently waived CATA Air Navigation Order (ANO II-17) respecting the carriage of emergency locator transmitters. It should be stated that CATA has recently redrafted and reissued this ANO to be effective 1 April 1982. This revised ANO should ensure that the target population will be required once again to carry ELTs as was the case before 1977.

g) The revised CATA ELT technical performance standards will be for one year shelf life of alkaline type batteries for operation at -20°C for 50 hours transmission, the same as the current FAA requirement. This standard differs significantly from the original CATA standard of -40°C for 100 hours transmission.

h) CATA SAR related accident reports show the following findings on ELTs carried in civil aircraft in Canada from 1976 to 1980, inclusive:

i) the number of ELTs carried has decreased by 42% from 1976 to 1980 indicating that civil operators have removed them from aircraft as a result of the lithium battery problem.

ii) of the 323 SAR-related accidents reported by CATA accident investigators, no report was made on 49 and 74 were reported as not carrying ELTs. Of the remaining 200 cases, 77 (38%) of ELTs carried were found to have functioned effectively, 123 (62%) ineffectively;

iii) of the 200 cases where ELT information was reported by CATA investigators, only 79 (39%) of their reports had information to show the effectiveness by type of ELT and, of these 79, only 6 (8%) of the various types carried functioned effectively. The remaining 73 (92%) were judged ineffective. The Leigh Sharc 7K ELT was the most common type of ELT to fail, followed by the Garrett Rescu 88C, the most common ELT carried in Canadian and US registered aircraft.

iv) general lack of durability, failure to activate on impact and breakage of aerials were cited by CATA accident investigators as the major cause of ineffectiveness in present generation ELTs, aside from the previously highlighted lithium battery problem.

j) CATA to date has not conducted a systematic and comprehensive education program to ensure that both the client and target populations are fully familiar with the various types of current generation ELTs including their maintenance and operation as well as their limitations and costs.

k) From CATA studies conducted by DAS, the Team found that time to location by a search aircraft can be cut by a factor of six if the ELT functions effectively. FAA and USAF studies confirm this ratio in the US.

l) ELTs trigger a similar percentage of SAR false alarms in the USA as in Canada and are subject to the same deficiencies with less than 40% of current state-of-the-art ELTs functioning effectively after an aircraft accident.

m) ICAO does not consider the carriage of ELTs mandatory for contracting states. In fact, ICAO experts stated that they foresee frequency jamming problems and an excess of SAR false alarms occurring, particularly if SARSAT becomes operational. ELT ICAO experts also see frequency stability as a serious problem area which requires resolution.

n) Some US aircraft manufacturers which produce small private and commercial aircraft are including an ELT as part of the aircraft component system. Most experts interviewed felt that next generation ELTs should be included as part of the aircraft, preferably located in the tail or in the wing tips. They further stated that inclusion of an ELT should be a basic requirement before a certificate of airworthiness is granted. However, CATA does not appear to be encouraging this.

General Observations

4.46 These observations and descriptive profile lead to the following general observations concerning the personnel survival regulating activity:

a) Existing CATA regulations and orders for flight planning under visual flight rules permit pilots too wide a discretion in flight following and reporting standards and this results in an undue workload on SAR operations resources. It would be prudent for CATA and ICSAR to discuss these flight planning regulations and orders before implementing new flight planning procedures.

b) The existing CATA Air Navigation Order (Series V, No.12) pertaining to aviation personnel survival in sparsely settled areas is inconsistent with the realities of seasonal climatic and environmental conditions prevailing in most areas of Canada. In particular, the boundary as defined by CATA, between settled and sparsely settled areas where emergency survival equipment and radio systems must be carried, requires revision. Also, standards and practices for personnel survival should be established and included in flight crew qualification examinations.

c) Existing state-of-the-art emergency locator transmitters are better than nothing. However, it is evident that a considerable amount of work is required to make the ELT a crash survivable and effective SAR alerting and locating component for carriage in private and small commercial aircraft. Specifically, both the federal government and the Canadian aviation private sector should make a concentrated effort to emphasize the importance of the ELT through regulation and education. At the same time both should work towards increasing the overall reliability and effectiveness of the ELT for carriage in small civil aircraft.

Conclusions

4.47 The Team's analysis in Section 3 of non-distress air SAR incidents showed 44% of false alarms in the period 1976-1980 were activated by ELTs, and that ELTs are not crash-worthy. Thus much remains to be done to make them reliable alerting and locating devices. As noted elsewhere in this report, a special effort and management arrangements will be required. In view of CATA's responsibility for the alerting function, the Team believes CATA should take the lead in this development, with the assistance of other departments. There is also a need to revise the criteria for and the boundary between settled and sparsely settled areas.

Enforcing

Objective

4.48 "To ensure compliance with aviation SAR prevention standards".

Descriptive Profile

General

4.49 According to FAA and CATA documents most citizens voluntarily comply with the law and for those persons, enforcement is not necessary - hence voluntary compliance. While punishment or the threat of punishment is the ultimate enforcement tool, it is not the only effective means, nor necessarily the most appropriate means in all cases to obtain compliance. However, whenever other means are not effective or appropriate, the use of punishment or the threat of punishment should be available and used by enforcement personnel.

CATA Enforcement Activities

4.50 Enforcement of the Air Regulations and Air Navigation Orders is a joint task of CATA and the RCMP. Legal services for the Crown are provided by the Department of Justice (DOJ). A violation of air regulations or orders is an offence under the Aeronautics Act and may be handled administratively or through judicial action. CATA actions consist of administrative sanctions which are applied through Letters of Warning or suspension of a document of entitlement pursuant to Air Regulations paragraph 407(a). Judicial action is prosecution pursuant to the Aeronautics Act subsections 6(4), 6(5), or 6(6). Administrative sanctions and prosecutions comprise the term "deterrent action".

4.51 Enforcement in the eyes of CATA includes surveillance, detection, gathering all pertinent data, prima facie evidence, witness statements and reporting. Administrative or judicial enforcement action can be taken whenever there are reasonable and probable grounds to believe that an infraction has occurred.

4.52 The aviation community learns of CATA rules and regulations through various training and information processes conducted through CATA personnel licensing and aircraft certification as well as through the activities of private companies and associations and aviation insurance agencies.

CATA Enforcement Capabilities

4.53 As noted earlier in this evaluation, the Dubin Commission has been mandated to inquire into CATA enforcement and its sufficiency in meeting flight safety objectives. Evidence and complaints presented to the Dubin Commission by CATA regional specialists and by other experts were summarized by Mr. John Sopinka, the Commission's Legal Counsel, on July 28, 1980, when he stated that there is:

- lack of clear and intelligible regulations (CATA);
- lack of clear guidelines from headquarters (CATA Ottawa);
- lack of support from headquarters (CATA Ottawa) for vigorous enforcement;
- too few enforcement officers (CATA) and an absence of training for those in place; and
- inadequate enforcement has resulted in significant air safety violations.

It is anticipated that Mr. Justice Dubin will reiterate these statements as findings in Volume 2 of his report which is expected by the end of 1981.

Observations

4.54 The Team attempted to analyse the information and enforcement statistics provided by CATA DLI in relation to DND SARSTATS and TC-AIDS cause assessments for SAR incidents but found that they could not be correlated to produce a meaningful evaluation. Nevertheless the following observations are submitted with respect to SAR prevention enforcement activities:

a) A continuing source of frustration to DND has been the alleged inability of CATA to take appropriate enforcement action against civil aviation personnel. An example of how DND frustration reached a head is illustrated in a 1980 DND message shown at Annex IV-1.

b) ANO II-17 respecting ELTs is waived at present and therefore unenforceable (refer previous observations under Regulatory sub-activity).

c) Air regulations 542 and ANO V-3, weather minima standards for VFR flight, are difficult to enforce. According to CATA enforcement experts, it is very difficult to prove a flight crew was not in visual contact with the earth's surface at all times during a VFR flight unless a civil air inspector actually witnessed the infraction. Notwithstanding, failure to comply with this regulation and order is a major cause of SAR incidents as illustrated in Part II of this evalution.

d) ANO V-12, carriage of emergency equipment and radios, is not enforced by CATA. In the view of one regional manager, this is difficult to enforce because he has insufficient personnel at his disposal to physically check aircraft emergency equipment. Most of the aircraft subject to this ANO, especially helicopters, operate in remote, hard to reach areas. The emergency equipment is usually sealed, carried in an inaccessible part of the aircraft and very tightly packed to save room. In order to verify the contents and check that it meets the requirements of the ANO, an inspector would have to unpack the whole kit with considerable cost in time and money to the aircraft operators. This rationale is viewed as unacceptable by the Team.

e) In Annex IV-1, Enforcement Statistics 1980, administrative warning letters were issued to most violators. This Annex also shows that the DGCA memo to all RCCAs, dated November 4, 1980 mentioned previously, requested all CATA regional offices to review deterrent actions for flight planning infractions and consider the appropriateness of more positive deterrent measures in future cases. This request does not seem to have produced any significant improvement particularly in curbing SAR false alarms.

f) The time frame between the report of an infraction and completed enforcement, while not available for SAR related violations, averaged 95 days for all administrative actions in 1980. CATA has no time frame contol once a charge has been laid as this is in the hands of the courts.

g) Several CATA regional managers considered Crown Counsels and Judges ill-informed on civil aviation SAR related regulations and orders. According to these and other experts, legal people generally are not fully aware of the effects on SAR operations when they consider a violation of air regulations. Also, according to CATA enforcement specialists, the courts have consistently meted out weak punishments.

h) The RCMP has not consistently co-operated and co-ordinated with DOT enforcement specialists before laying charges under the Aeronautics Act. This problem area has been identified both by CATA and the RCMP. As a result, more regional CATA/RCMP seminars are being held, RCMP Divisional Investigative training courses will soon include CATA enforcement specialists and a recent RCMP national policy bulletin, OM-126, indicates that the RCMP recognize that liaison with CATA is essential for professional handling of RCMP detected aeronautics violations including SAR related violations.

i) At present, the approximately 15 CATA enforcement specialists do not conduct compliance promotion programs aimed at educating the target population although plans are underway in CATA to launch a compliance education program sometime in the future. This program, which in the eyes of some experts is sorely needed, should help explain the intent and rationale of SAR related regulatory standards and recommended practices.

j) Increased liaison with DOJ, RCMP, and DOT/CATA to bring home the seriousness of SAR-related violations and the need to report them would require, according to CATA's rough estimate, one enforcement person-year per region i.e. six additional Civil Air Inspectors at an annual cost of approximately 240K 1980/81 dollars.

k) Findings in reports of civil aviation accident investigations normally are passed internally to CATA regulation enforcement officers but it was said that one CATA region does not follow through with an analysis of these reports to detect possible SAR-related infractions of air regulations.

l) The present policy and procedures for co-ordination between accident investigation and enforcement investigation specialists was considered by experts to be satisfactory except that enforcement specialists are precluded from using ATS tapes as evidence in court actions. This exception has a negative impact on the achievement of the SAR prevention enforcement objective when deliberate breaches of flight reporting and weather minima standards are recorded.

m) Aviation insurance companies can and do penalize their policy holders if adjustors discover there has been an infraction of civil air regulations and orders, particularly when there was significant property damage or public liability involved in an accident. However, it was observed that aviation insurance policies in Canada make no provision for SAR insurance coverage chiefly because the Crown so far has not taken administrative and legal action either to prosecute those responsible for causing a SAR incident or to recover the costs of ensuing SAR operations.

General Observations

4.55 These observations and descriptive profile lead to the following general observations on achieving the enforcing objective of SAR prevention:

(a) In view of the activities of the Aeronautics Act Task Force and the evidence presented to the Dubin Commission, CATA enforcement specialists and agencies, including police forces, are neither staffed nor trained to deliver effective SAR prevention enforcement measures at this time. Of particular concern to SAR prevention is CATA's inability to enforce the provisions of flight planning, weather operating minima and personnel survival regulations and orders effectively. This suggests that in the interests of SAR prevention, CATA should not wait for the resolution of the Aeronautics Act Task Force and Dubin Commission recommendations but rather should begin increased enforcement action in these areas.

Conclusions

4.56 The Team concluded that CATA is not effectively enforcing flight planning or weather related and personnel survival regulations and that a significant reason for this is a lack of sufficient enforcement personnel. In the interests of reducing SAR incidents, this could and should be quickly remedied. DOT/CATA, through discussion with the Solicitor General, the RCMP and officials of Provincial Attorneys General, should arrive at a co-ordinated national approach to more vigorous enforcement.

Promoting and Educating

Objective

4.57 "To make the public aware of aviation SAR prevention measures".

Descriptive Profile
General

4.58 There are two federal departments directly involved in this sub-activity although both focus primarily on accident/incident prevention rather than on SAR prevention. Those involved in the promotion of safety awareness include two specialists from the CATA Aviation Safety Bureau (DAS) and six other specialists called Regional Aviation Safety Officers (RASO's) located at the six CATA regional offices. From DND, there is the Directorate of Flight Safety for accident and incident prevention and, to a lesser degree SAR prevention, the Directorate of Air Operations and Training (DAOT) together with field SAR unit representatives who focus mainly on civil and military SAR prevention promotion and education under the title of "Defensive Flying Program".

4.59 DND: the major identifiable SAR prevention promotional and educational activity for civil aviation is the Defensive Flying Briefings mounted by DND. These briefings were started by CF #413 SAR Squadron about 1969. Subsequently, all five CF/SAR units were encouraged by Air Transport Command and by NDHQ/DAOT to conduct similar briefings. These units were provided at that time with standard briefing materials. DND does not consider the present briefings a specific task but rather a series of sessions to be given to the client population by and at the judgment of the SAR units. NDHQ has directed units to co-ordinate their presentations with the CATA RASO to avoid overlap into CATA's educational responsibilities to civil aviation publics.

4.60 The general scope and content of the DND SAR unit briefings are:

a) providing information on the unit, its equipment and capabilities for purposes of familiarization with the Canadian SAR resource structure;

b) providing information on defensive flying practices to prevent accidents/incidents; and,

c) providing information on the causes of SAR related accidents in order to avoid repetition.

4.61 CATA: within CATA, DAS has recently undertaken a national study and campaign to reduce the number of weather related aircraft accidents in Canada. In addition to providing national and regional co-ordination for the campaign, DAS/ASP and the RASOs conduct safety promotion activities and assistance to the Canadian civil aviation community. In the past, DAS/ASP has participated extensively in SAR related interdepartmental and internal committees and working groups to encourage SAR prevention and survival in conjunction with its primary task of aviation safety promotion and accident prevention. This work has included the evaluation of survival kit specifications and arranging for testing the kits, training public servants and others at the DND Survival Training School and preparatory work for a Canadian aviation survival manual.

Other Agency SAR Related Promotion and Education Activities

4.62 ICAO - ICAO in a formal sense neither promotes nor educates contracting state aviation communities in SAR prevention. For example, there is no ICAO sponsored post accident/incident survival manual nor are there ICAO notes on contracting state SAR capabilities and permanent air navigation hazards in these states. As matters now stand, ICAO appears more concerned with major international air carrier safety aspects where a SAR problem does not appear to exist.

4.63 USA - The USAF stages defensive flying presentations at the request of the FAA at FAA sponsored safety promotion and education seminars which are scheduled regularly across the USA. This is a project in which both organizations fully co-operate and co-ordinate their efforts.

4.64 Aviation Insurance - The largest aviation insurance broker in Canada (Reed Stenhouse) recently instituted an accident prevention evaluation program directed at commercial helicopter owners and operators underwritten by their insurers. This program was generated by the steadily increasing helicopter accident rate in Canada. If the prospective or current policy holder fails to pass this evaluation, Reed Stenhouse normally will not seek insurance coverage. Co-ordination between CATA/DAS officials and Reed Stenhouse on this program and on other matters is not conducted formally although recently there have been informal discussions and an exchange of views in Canadian Aviation magazine. This exchange of views served as a useful educational tool for readers of this publication.

Observations

4.65 For this activity, it was observed that:

a) There are no national or regional policies and guidelines as to the scope, content and frequency of the "on request" DND defensive flying briefings. DND allocates no specific funds or person-years to this project. Also, it was observed that this project is managed and executed mainly on the individual initiative of SAR unit commanders who rely on training funds and unit personnel to provide regional SAR promotion and education outputs. The importance and merit of this DND activity was stressed by representatives of national and provincial civil aviation associations as well as by others, particularly those who fly in remote areas of Canada, e.g. Dome Petroleum.

b) RASO presentations are given at the request of the client population, normally after the client has been approached by CATA. A similar situation prevails for DND Defensive Flying presentations indicating that generally these presentations are given more on an ad hoc than a planned basis.

c) Although CATA knows the target population at which to aim safety and SAR prevention measures, RASOs in several CATA regions stated that their visits and presentations were directed at the full spectrum of flying and maintenance populations rather than at target populations.

d) DAS has recently instituted a voluntary safety evaluation project to assist private and commercial aviation owners and operators in identifying safety deficiencies.

e) Most experts interviewed, both public and private, stated that the CATA RASO activities were effective from a SAR prevention standpoint and should be bolstered with additional funds and person-years in order to make full and regular contact with the target population.

f) RASOs do not keep detailed records of characteristics of client populations addressed. A similar observation was made for those attending DND Defensive Flying presentations indicating that both departments may be preaching to the converted rather than to target populations.

g) CATA accident prevention specialists object to DND SAR personnel including interpretations of civil aviation regulations and orders in their SAR presentations. In this connection, it was observed that CATA and DND programs are not formally co-ordinated either nationally or regionally nor in most cases, are their presentations jointly conducted.

h) DND and DOT press releases have not highlighted the costs of SAR operations even in cases where there was incontrovertible evidence of non-compliance, e.g. failure to close a flight plan, aircraft overloading and other acts of negligence. Also, it was noted that

DND Defensive Flying and CATA RASO presentations do not highlight the costs to the taxpayer or the hazards and risks involved for responding search and rescue personnel.

i) US licensed private pilots who are about 10% of those involved in SAR related accidents in Canada (refer Section 3) appear ill-informed on environmental conditions and operating rules unique to Canada. Efforts to educate this sizeable population by regional DND and CATA personnel was evident but there is no co-ordinated effort on a national scale by either department's headquarters staff.

j) Representatives of the Canadian Business Aircraft Association, RCFCA and provincial aviation councils, all expressed interest in voluntarily augmenting federal SAR prevention promotion and education activities.

General Observations

4.66 These observations and descriptive profiles lead to the following general observations on achieving the promotion and educating objective of SAR prevention:

a) DND Headquarters and Air Command resources are not being fully used to promote SAR prevention awareness, particularly to the civil aviation target population. This is attributable in large part to the fact that DND is not legally responsible for the regulation and education of the civil aviation population in Canada. These responsibilities are assigned to and are assumed by CATA. As a result, there is a noticeable lack of co-ordination and co-operation between DND and CATA at Headquarters and at some regional levels.

b) The CATA safety awareness program and Regional Aviation Safety Officer accident prevention programs appear successful in reducing accidents. They offer an established and related structure towards promoting SAR prevention and educating the target populations on SAR prevention measures. To date, this CATA concept has not been fully exploited, mainly due to a lack of resources and a disproportionate distribution in size and location of the SAR target population.

c) It is difficult to identify from current DND and CATA records whether promotion and education measures are reaching the target population; DND and CATA should record details of the size and characteristics of the client populations they address.

d) There is a wealth of aviation expertise in the Canadian private sector particularly in the larger air carriers, private business corporations, volunteer air associations and provincial aviation councils which could be utilized by the federal government to augment SAR prevention promotion and education efforts.

e) Insufficient use is made of the media to educate the public on the causes, risks and costs of SAR operations, particularly where these operations were generated by Canadian and US pilots who clearly disregarded accepted aviation standards and practices.

Conclusions

4.61 The Team concluded that more formal co-ordination and co-operation between DND and CATA, at headquarters and in the field, could make safety promotion efforts more effective and that such efforts could be considerably augmented by drawing on private organizations. Finally, as a result of discussions with SAR experts and the public, the Team believes there should be greater use of the media to inform the public of the causes of SAR incidents, the risks imposed on SAR personnel and the cost of both necessary and unnecessary responses.

SECTION 5 - MARINE SAR PREVENTION TARGET POPULATIONS

General

5.1 In order to design an effective program of marine SAR prevention, it is critical to be able to identify two major sets of data. First, the population, in terms of magnitude and nature of activity of those craft and operators involved in SAR incidents. This information is needed in order to direct the content and delivery of the program. Second, the causes of the incidents that place these craft in a SAR situation must be determined in order to derive the content of the program. Ideally, information should also be obtained about the characteristics of the individuals involved and the circumstances of the operation in order to determine the most suitable means of reaching the target population.

5.2 The data from SARSTATS has been analyzed for type of craft involved and for nature and cause of the incident for both distress and non-distress SAR incidents but SARSTATS has insufficient information. In many cases, data is entered under the "other" category, and hence there is a large proportion of cases where needed information is not available.

5.3 Tables 3-16 - 3-21 derived from Part II Section 3 portray the type of vessel involved, type of emergency and attributed cause for distress and non-distress SAR incidents.

Observations

5.4 The following observations may be obtained from this data:

(a) Pleasure craft accounted for 59% of both distress and non-distress SAR incidents.

(b) 61% of all reported incidents occurred in the Victoria SRR.

(c) Fishing vessels accounted for the second highest overall incident rate but represented by far the largest SAR activity in the Halifax SRR, for both distress and non-distress incidents.

(d) The most significant types of non-distress incidents are breakdowns (50%).

(e) 12% of all non-distress incidents showed either no information or "other" for type of vessel involved in the incident.

(f) 38% of all non-distress incidents showed either no information or "other" for type of emergency.

(g) 64% of all non-distress incidents showed either no information or "other" for cause of incident.

TABLE 3-16 DISTRESS CASES 1976-80

		VICTORIA		EDMONTON		TRENTON		HALIFAX		NATIONAL TOTAL	
	DISTRESS										
	M1	619	(54)	7	(-)	320	(28)	208	(18)	1,154	(67)
	M2	312	(56)	1	(-)	190	(34)	57	(10)	560	(33)
		931	(54)	8	(-)	510	(30)	265	(16)	1,714	
V	COMMERCIAL	19	(29)	1	(2)	17	(26)	28	(43)	65	(4)
E T	FISHING	332	(72)	1	(-)	18	(4)	113	(24)	464	(27)
S Y	PLEASURE	520	(52)	3	(-)	428	(43)	54	(5)	1,005	(59)
S P	TUG	21	(95)					1	(5)	22	(1)
E E	BARGE					1	(100)			1	(-)
L	OTHER	39	(25)	3	(2)	46	(29)	69	(44)	157	(9)
		931		8		510		265		1,714	
E	BREAKDOWN	29	(19)	1	(1)	78	(52)	43	(28)	151	(9)
T M	GROUNDING	44	(44)			49	(49)	7	(7)	100	(6)
Y E	TAKINIG ON WATER	228	(70)			48	(15)	49	(15)	325	(19)
P R	CAPSIZING	263	(63)	3	(1)	129	(31)	20	(5)	415	(24)
E G	FOUNDERING	60	(55)			41	(37)	8	(7)	110	(6)
E	AFIRE	176	(76)			32	(13)	25	(11)	233	(13)
O N	LOST	2	(7)			18	(67)	7	(26)	27	(2)
F C	MAN O/BOARD	73	(61)			38	(32)	8	(7)	119	(7)
Y	OTHER	56	(24)	3	(1)	77	(33)	98	(42)	234	(14)
		931		8		510		265		1,714	
C	MECHANICAL FAILURE	1	(33)			-	(-)	2	(67)	3	(-)
A	WEATHER	16	(8)	4	(2)	159	(78)	25	(12)	204	(12)
U	OUT OF FUEL	4	(12)			28	(82)	2	(6)	34	(2)
S	ENGINE FAILURE	10	(12)	2	(1)	45	(53)	29	(34)	85	(5)
E	GEAR FAILURE	-	(-)			12	(80)	3	(20)	15	(1)
D	COLLISION	22	(52)			12	(29)	8	(19)	42	(2)
	GROUNDING	56	(67)			23	(27)	5	(6)	84	(5)
B	FOUL PROP.	4	(44)			5	(56)	-	(-)	9	(1)
Y	LOST	2	(15)			7	(54)	4	(31)	13	(1)
	OTHER	816	(67)	3	(-)	219	(18)	187	(15)	1,225	(71)
		931		8		510		264		1,714	

TABLE 3-21 TYPE 3 NON DISTRESS CASES 1976-80

		VICTORIA		EDMONTON		TRENTON		HALIFAX		NATIONAL TOTAL	
V	NO INFO	1,542	(83)	35	(2)	263	(14)	27	(1)	1,867	(7)
E T	COMMERCIAL	83	(33)	7	(3)	83	(33)	29	(31)	252	(1)
S Y	FISHING	2,971	(45)	6	(-)	29	(-)	3,634	(55)	6,640	(27)
S P	PLEASURE	10,041	(67)	143	(1)	3,917	(26)	804	(6)	14,905	(59)
E E	TUG	207	(87)	-	(-)	20	(8)	12	(5)	239	(1)
L	BARGE	4	(100)	-	(-)	-	(-)	-	(-)	4	(-)
	OTHER	522	(42)	10	(1)	299	(24)	400	(33)	1,231	(5)
		15,370	(61)	201	(1)	4,611	(18)	4,956	(20)	25,138	(100)
	INBOARD	3,839	(75)	33	(1)	1,026	(20)	190	(4)	5,088	(20)
V	OUTBOARD	2,430	(65)	31	(1)	1,242	(33)	50	(1)	3,753	(15)
E P	INBOARD/OUTBOARD	5,256	(89)	13	(-)	643	(11)	8	(-)	5,920	(24)
S O	SAIL	279	(33)	59	(7)	472	(57)	26	(3)	836	(3)
S W	SAIL-INBOARD	812	(74)	-	(-)	271	(26)	12	(-)	1,095	(5)
E E	SAIL-OUTBOARD	567	(72)	1	(-)	204	(26)	12	(2)	784	(3)
L R	OAR-ETC.	183	(56)	17	(5)	122	(37)	6	(2)	328	(1)
	OTHER	2,004	(27)	47	(1)	631	(9)	4,652	(63)	7,334	(29)
		15,370	(61)	201	(1)	4,611	(18)	4,956	(20)	25,138	(100)
E	BREAKDOWN	7,340	(59)	21	(-)	1,858	(15)	3,262	(26)	12,481	(50)
T M	GROUNDING	1,195	(62)	7	(-)	658	(34)	81	(4)	1,941	(8)
Y E	TAKING ON WATER	314	(70)	4	(-)	65	(15)	62	(14)	445	(2)
P R	CAPSIZE	50	(15)	11	(3)	241	(74)	22	(7)	324	(1)
E G	FOUNDERING	2	(9)	1	(4)	20	(87)	-	(-)	23	(-)
E	AFIRE	24	(43)	-	(-)	27	(48)	5	(9)	56	(-)
O N	LOST	76	(39)	-	(-)	75	(38)	44	(23)	195	(1)
F C	MAN O/BOARD	1	(17)	-	(-)	4	(66)	1	(17)	6	(-)
Y	OTHER	6,368	(66)	157	(2)	1,663	(17)	1,479	(15)	9,667	(38)
		15,370	(61)	201	(1)	4,611	(18)	4,956	(20)	25,138	(100)
C	MECHANICAL	12	(75)	-	(-)	-	(-)	4	(25)	16	(-)
A	WEATHER	32	(6)	11	(2)	441	(86)	23	(4)	507	(2)
U	OUT OF FUEL	584	(62)	7	(1)	275	(29)	72	(8)	938	(4)
S	ENGINE FAILURE	1,364	26)	7	(-)	1,255	(24)	2,677	(50)	5,303	(21)
E	GEAR FAILURE	49	(15)	5	(2)	158	(52)	94	(31)	306	(1)
D	COLLISION	14	(47)	1	(3)	13	(43)	2	(7)	30	(-)
	GROUNDING	1,161	(85)	8	(1)	120	(9)	67	(5)	1,356	(5)
B	FOULED PROP.	201	(31)	1	(-)	70	(11)	380	(58)	652	(3)
Y	LOST	11	(13)	-	(-)	38	(44)	37	(43)	86	(1)
	OTHER	11,942	(75)	161	(1)	2,241	(14)	1,600	(10)	15,944	(64)
		15,370	(61)	201	(1)	4,611	(18)	4,956	(20)	25,138	(100)

(h) The most significant types of distress incidents are capsizing and taking on water (43%).

(i) After "other", the most significant cause of distress incidents is weather.

(j) After "other", the most significant cause of non-distress incidents is engine failure.

Conclusions

5.5

(a) One third of all incidents arise from pleasure craft non-distress incidents in the Victoria region, usually as a result of breakdowns. Fishing vessels have the highest incident rate in relation to their numbers. Marine SAR prevention efforts should therefore focus on fishermen and pleasure boaters.

(b) The SARSTATS system does not record much of the information necessary to allow the thorough analysis required to develop an effective marine SAR prevention program. Measures should be taken to improve this system.

SECTION 6 - ANALYSIS OF MARINE SAR PREVENTION SUB-ACTIVITIES

Investigating

Objective

6.1 "To determine the causes of all marine SAR incidents".

SAR Incident Investigations

6.2 Investigations of SAR incidents are undertaken by a variety of marine authorities. These include : CCG Casualty Investigations staffs whose activities range from informal fact finding to formal investigations; public inquiries, which may be appointed by provincial or other levels of government; coroner's investigations, or police investigations. For major SAR cases, the RCC staffs prepare a Special Report which analyzes a particular incident, draws conclusions and makes recommendations for corrective action. Copies of these reports are received at NDHQ (DAOTNW5) and at CCG (Chief of SAR), and are presented at ICSAR together with "Unnecessary SAR Alert" reports (UNSAR's). There is no formal requirement for reply or comment on these distributions of marine related SAR Special Reports, but distribution is clearly outlined in DND (CFP 209).

6.3 Marine reports have been sent directly to the CCG Chief of SAR since July 1981, and may be sent to other involved agencies at the discretion of the DND Regional Commander.

Accident/Incident Investigations

6.4 The investigation and analysis of marine casualties is a crucial part of a marine safety program. It is through this investigation that causes of accidents are discovered and remedial measures are recommended. The Chief of Casualty Investigations is responsible for this function in the Coast Guard and for directing the development of proposals for new or revised legislation, regulations and directives in matters pertaining to investigations in light of their findings. Remedial preparation and analysis of statistical data on marine casualties as well as the associated analysis of trends and incidents to assess human, navigational or equipment problems are also conducted.

6.5 To carry out these functions, Casualty Investigation has a mandate to investigate the cause of any accident to any ship, whether attended by loss of life or not. This includes all groundings, collisions, capsizings and sinkings. Although approximately 1,000 such casualties occur each year, present staffing levels allow only about 200 to be pursued. As a result, accidents that are investigated tend to be the ones involving deaths, collision, commercial implications or high public interest.

6.6 Major investigations follow four stages : informal fact finding, an in-camera Preliminary Inquiry, a public hearing and finally, the formal investigation. Reports are sent to Ship Safety Branch when remedial action is recommended, and also the Chief of SAR, CCG, when Search and Rescue activity was involved. Summary reports of such investigations are provided to ICSAR.

6.7 The CCG SAR division also performs a cursory statistical analysis of SAR incident causes, which is used primarily to direct future promotion or education efforts.

Observations

6.8 For this activity, it was observed that:

(a) DND daily SAR incident, unnecessary SAR (UNSAR) and Special SAR reports as well as the DND quarterly and annual SAR statistics are received by CCG/CGVR. There is little evidence of detailed analysis of these data by either CGVR or regional SAR personnel.

(b) Casualty Investigation Branch (CCGI) investigates mostly incidents where commercial vessels are involved i.e. approximately 31% of all distress incidents.

(c) CCGI of CCG reports do not result in revision of the SAR data as to probable causes of the incident.

(d) CCGI considers the confidentiality of the information they receive to be paramount.

(e) Ship Safety Branch does not necessarily agree with CCGI findings and recommendations.

(f) The causes of incidents are in many instances not recorded in SARSTATS or are put into a catchall "other".

(g) Marine insurance companies do not investigate incidents per se.

(h) Incidents in which fatalities have occurred in pleasure craft are investigated by the police forces and by the coroner but their findings are not always incorporated in the SARSTATS.

(i) Ship owners make their own investigations of incidents.

(j) The Canadian Power Squadron, the Canadian Yachting Association and the Red Cross monitor incidents in order to adjust their training programs.

(k) There is no mechanism to ensure co-ordination and co-operation in the exchange of information or to identify and use the expertise of each organization for the benefit of the community.

General Observations

6.9 (a) Information gathered from investigation of SAR incidents is inadequate to design and target a SAR prevention program effectively.

(b) Casualty Investigation Branch (CCGI) is not staffed to investigate all SAR distress incidents adequately.

(c) CGVR does not analyze CCGI reports in detail for the purpose of accumulating information on probable causes of incidents investigated by CCGI that relate to SAR.

Conclusions

6.10 Existing staffing levels within the Canadian Coast Guard permit investigation of only 200 of 1,000 reported groundings, collisions, capsizings and sinkings. SAR division makes little use of the limited analysis being done on these casualties. Further, there is no continuing organized analysis of SAR incident patterns, characteristics and causes, those involved, aid requirement, who responded, cost of response, trends and information, all of which are essential for the design of effective prevention programs and response postures.

Regulating
Objective

6.11 "To provide essential SAR prevention standards for marine vehicles, equipment and personnel including personnel survival standards.

Descriptive Profile
General

6.12 In the marine environment, regulatory control in Canada is through the establishment and monitoring of vessel and personnel standards set in accordance with the Canada Shipping Act. It also includes the development of other standards of marine competence that are encouraged through private sector activities such as company orders and procedures, boating association practices and instruction, as well as through the provision of courtesy inspections of pleasure craft and the structured evolution of marine legislation by the CCG.

Marine Safety Regulating

6.13 The CCG has the broad responsibility of developing and applying safety standards for Canadian ships. This includes design, construction, operation, equipment, navigation, cargo and personnel, and thus covers safety concerns related to all aspects of marine operations. In practice, this responsibility is carried out for ships exceeding fifteen registered tons, as smaller vessels are exempt from the requirement to register under the Canada Shipping Act. For registered vessels, however, the degree of regulation is comparable to aircraft in the aviation world and is subject to inspection, licensing, regulation and associated compliance actions. Marine operators can be classified generally as commercial, fishing or pleasure. Because of this relatively high degree of regulation and the professional nature of commercial operations, there is little SAR problem with commercial vessels. For fishing vessels and pleasure craft, however, there is a SAR impact. In the former case economic incentive produces marginal operations and in the case of pleasure craft, vessel size and the vast numbers involved exempt them from the direct effect of most marine regulatory programs.

6.14 As part of its overall responsibilities, the Ship Safety Branch of the Canadian Coast Guard drafts and amends the Small Vessel Regulations and Boating Restriction Regulations, tests and evaluates life-saving appliances, and establishes and enforces small boat construction standards. In addition, a member of this Branch acts as Chairman of the Small Craft Committee of the Marine Safety Advisory Council (MSAC). MSAC comprises representation from all aspects of marine industry, and in particular, the Small Craft Committee involves representatives from the Canadian Yacting Association, Canadian Power Squadrons, Allied Boating Association, Canadian Boating Federation, The Canadian Red Cross, Canada Safety Council, the Ontario Marina Operators Association, the Royal Lifesaving Society and other involved groups. All provinces are invited to attend the bi-annual meetings, although only Ontario, Alberta, and British Columbia regularly send representatives.

6.15 The MSAC structure is used as a mechanism for exposing proposed new or amended regulations to the operators involved. It is also a forum for discussion of all matters of joint interest and is apparently well received by those who attend.

SAR Prevention Regulating

6.16 Regulations related directly to Marine Search and Rescue are derived from section 445 of the Canada Shipping Act, which requires vessels to respond to distress signals and allows the Minister of Transport to appoint rescue co-ordinators for marine SAR incidents. In June 1960, an amendment to the Act charged the Minister of Transport with general superintendence of all matters relating to wrecks, salvage and shipping casualties.

6.17 In the area of SAR prevention, most regulatory activities pertain to the provision of a safe marine transportation system and are not necessarily directed at recreational boating. The prevention of accidents has the effect of preventing some SAR incidents. The commercial shipping community is subject to a greater degree of regulation than smaller craft, and also is involved in fewer incidents. There are some programs directed at smaller vessels in CCG regions. CCG Boating Safety Detachment (BOSDET) personnel offer a courtesy inspection to interested boaters. With the concurrence of the boat operator, CCG SAR staff inspects the vessel against equipment standards or for deficiencies that it would be in the interest of the owner's safety to correct. Other efforts primarily in promotion/ education are also directed at smaller vessels.

Legislative Development

6.18 The regulatory control and, in particular, the development of legislation in the marine environment has a significant impact on the prevention of SAR incidents. Although not subject to the same extent of regulatory control as aviation, marine affairs are subject to a regime of regulation that is kept current through the Office of the Chief of Legislative Development in the Canadian Coast Guard.

6.19 A major development is now in progress to update and organize the provisions of the Canada Shipping Act and other pertinent legislation in the Maritime Code. The Code, which will consist of six books, will cover rules of Maritime Conduct, Ships and Structures, Personnel, Cargo, the Voyage and application to Air Cushion Vehicles. It will form the basis of maritime operations in Canada, and it will be through this mechanism that SAR prevention regulations will be codified. For example, provision will be made in the code to allow ticketing for violations, an effective enforcement measure.

Licensing

6.20 At the present time, the licensing of small craft is regulated under the Small Vessel Regulations. Licensing requires that all vessels not registered under the Canada Shipping Act but powered by engines of greater than 10 horsepower be licensed. The system is administered on behalf of the Department of Transport by Revenue Canada (Customs and Excise). A licensed craft is issued a number which is associated with the vessel even after the vessel is taken permanently out of operation or destroyed, since there is no requirement to revise records for this type of information.

6.21 The Canada Shipping Act provides the authority to issue regulations for small craft operator licensing but this is not exercised. Such authority will be continued under the Maritime Code.

Standards for Small Boat Operation

6.22 The establishment of standards of knowledge and the testing of operator capabilities are important aspects of regulating the marine community. Although a boat operator licensing system may be one means of ensuring a basic level of boating knowledge, other means are also possible. Several organizations are currently providing training and information courses that produce improved levels of boating education that are available to all recreational boaters who choose to take them. These activities are of prime importance in the prevention of SAR incidents, but since commitment to this education is voluntary, operators who achieve these standards have a motivation likely to make them safer operators in the first instance. This is, however, an expression of self-regulation, as these organizations promote a high standard of proficiency amongst the recreational boating community as a whole.

6.23 The CYA and CPS are associations that provide training that will permit boat operators to achieve graduated levels of knowledge and skill. This capability will provide the boater with a set of standards for safer boat operation. Both organizations, as well as other similar groups, attend meetings of the Small Craft Committee of the Marine Safety Advisory Committee. It was observed that at least some members of both the CYA and CPS felt there were benefits to both associations in making a common set of standards available to the public.

Observations

6.24 For this component, it was observed that:

Vessel and Personnel Regulatory Measures

(a) Ship Safety Branch focuses on all commercial vessels over 15 tons but concentrates on those over 100 tons.

(b) Ship Safety conducts no tests on new small boats under 15 tons unless the design does not fit a standard even though they must display a certification as to maximum permissible engine size.

(c) Some regions have safety committees consisting of union, management and CCG personnel which set standards for fishing vessels. These standards are usually higher than those prescribed by the separate entities.

(d) There is no requirement to file a voyage plan even when on a long passage.

(e) Inspections by BOSDET teams can only be on a requested basis.

(f) A master's certificate is not required for fishing vessels or pleasure craft under 100 tons. This represents the vast majority of the potential SAR clientele.

(g) Once a person has been certificated, no further competence tests are ever made.

(h) Small Vessel Regulations specify those safety items which should be carried on board.

(i) Insurance classification societies plus ship safety inspections result in few problems from commercial vessels.

(j) The procedures and tests required by the Department of Communications for radio licences are poor.

(k) Toronto Harbour Police have strict licensing regulations for both boats and personnel based within their jurisdiction.

(l) In the USA, all vessels are registered either by the state or by the USCG.

(m) There are fewer regulations with regard to vessels in the USA than in Canada.

(n) The USCG has the functions of regulating, investigating and enforcing.

(o) DND, DFO and CCG each issue vessel and personnel licences for their respective purposes with no co-ordination or realization of the impact of the others.

Personnel Survival Regulatory Measures

6.25 The CCG has introduced measures to enhance the survivability of the individual such as the Small Vessel Regulation, nevertheless, it was observed that:

(a) Most mariners, both commercial and pleasure, tend to believe in the freedom of the seas with regard not only to navigation but also to the survival equipment they carry. Nevertheless, in case of an accident/incident, they wish to be located and rescued instantly.

(b) Channel 16 on VHF is not kept clear for distress and safety calling and is used for long conversations.

(c) With the exception of tugs over 5 tons on the West Coast, the use of Electronic Position Indicating Radio Beacon (EPIRB) is neither encouraged nor compulsory.

(d) Although standards have been developed for immersion suits and one design approved, their carriage and use, especially for fishermen, is neither mandatory nor officially endorsed.

(e) The carriage of alternate visual means of identification such as an orange inflatable balloon manually activated is not actively promoted.

(f) There is no requirement to carry sufficient reserves of fuel and food to ensure a degree of survivability.

(g) GRS (CB) channels are completely uncontrolled and distress calls may be blanked-out by chatter.

(h) Most pleasure craft operators are unaware of their chances of survival in the waters in which they are voyaging.

(i) The fatalism accepted in the past by fishermen is gradually on the wain.

(j) BOSDET teams address themselves to these problems but hit only a minute percentage of the clientele.

General Observations

6.26

(a) The Marine Safety Advisory Council could be used for discussion and co-ordination of issues arising from consideration of SAR prevention, such as licensing, standards development, industry liaison and information delivery.

(b) A means of providing for the licensing of boat operators in the future could be achieved through the development of a common basic standard for small craft operations. This standard could be developed through deliberations of the Small Craft Committee of the Marine Safety Advisory Council which represents the principal parties involved.

(c) The regime of regulations pertaining to the marine SAR target population is adequate.

Conclusions

6.27 The Team concluded that agreed standards are an essential basis and precursor of a licensing system and that they would be useful for developing voluntary standards for small boat operator knowledge and competence, whether or not a decision is eventually taken on the desirability of licensing. The Team believes that if the Small Craft Committee of the Marine Safety Advisory Concil were used as a mechanism to consult on and co-ordinate the development of such standards, it would be another useful step in achieving a national as opposed to a federal view of prevention.

Enforcing

Objective

6.28 "To ensure compliance with marine SAR prevention standards".

Descriptive Profile

General

6.29 As discussed in the section on regulating, the control of large vessels is exercised through the authority of the Canada Shipping Act and is fairly complete in its application, including enforcement. The Act provides authority to detain vessels in port in case of non-compliance with certain safety-related regulations.

The Royal Canadian Mounted Police

6.30 In the case of small vessels, the RCMP is the primary agency involved with enforcement of the Canada Shipping Act and those elements of the Criminal Code that may apply to water activities. The RCMP, as the contracting police authority in many provinces, has an important role to play in the prevention program by: (a) enforcement, (b) inspections, (c) safety education, and (d) collection of statistical information related to their activities.

6.31 The professionalism of the Force, their wide physical distribution, and the fact that they are a federal enforcement agency combine to produce an effective SAR and accident prevention contribution.

6.32 In each of its divisions, the RCMP co-ordinates prevention-related activities through a Migratory Birds and Canada Shipping Act Officer. This officer designs a divisional approach to enforcement of regulations to suit regional needs. This involves an education element which is approached in a number of ways, such as participating with Coast Guard BOSDET units or Red Cross mobile safety units in "Safety Lanes" or Courtesy Inspections. When asked, officers will give talks and promote safe boating practices in their areas. The Canada Boating Handbook is distributed by RCMP personnel. Joint activities are arranged at provincial Small Craft Safety Councils which are chaired by the Red Cross. Coast Guard and RCMP members participate in these meetings.

6.33 The main goal of the RCMP in this regard is thus prevention through education and enforcement. Statistical information is kept by case or violation number. Efforts increased by 10 per cent in 1981 over 1980. Annex IV-2 provides details.

Enforcement Methods

6.34 Examples of the types of sanctions that could be applied for infractions of marine regulations are listed as follows:

- formal charges
- citations - written
- citations - verbal
- licences revoked or suspended
- vessels detained or operation forbidden
- notices (letters) of violation (reprimand)
- fines/charges
- refusal of insurance coverage.

6.35 In the marine environment, there is no organizational element charged specifically with the implementation of these sanctions intended to prevent accidents or SAR incidents. Rather, there are several authorities with responsibilities in enforcement who exercise powers related to their specific areas of expertise. For example, steamship inspectors may detain vessels; RCMP officers may lay charges under the Criminal Code or the CSA;

insurance companies may refuse coverage or demand substantial payment for coverage for vessels.

6.36 The Canadian Coast Guard is currently analyzing enforcement as it pertains to SAR to determine the merit and feasibility of granting greater enforcement powers or peace officer status to certain Coast Guard officers. A completion date for this analysis cannot, at the moment, be estimated.

Observations

6.37 SAR operational personnel are frustrated in their attempts to improve prevention by their inability to enforce regulations unless accompanied by a peace officer. Stemming from this and from expert opinion and interviews, it was observed that:

(a) RCMP and DOT have difficulty in obtaining court convictions with the result that they rely on warnings.

(b) Many exemptions to certification requirements, both vessel and personnel, are issued.

(c) Municipal and provincial police can enforce Small Vessel Regulations but seldom do so.

(d) DFO, DOC and CCG each issue certificates for their respective purposes to both vessel and personnel without determining the currency or relevance of the other department's certificates.

(e) USCG personnel are peace officers and, therefore, do enforce regulations.

(f) SAR personnel are hesitant to enter the peace officer role seeing this as a contradiction of their life-saving role and fearing that persons in distress may unduly delay a call for assistance from officers also identified as enforcement agents.

(g) DFO, whose officers are enforcers in their own field, has found that the crews of their vessels now multi-tasked to SAR are no longer considered to be the fishermen's enemy.

General Observations

6.38

(a) A peace officer may board and inspect a vessel in connection with the enforcement of the Small Vessels Regulations and may detain a vessel to prevent equipment shortfall violations. Steamship inspectors have this authority under the Canada Shipping Act. In addressing marine SAR enforcement activities therefore, both peace officers and steamship inspectors possess the required authority.

(b) It is apparent that the number of enforcement actions and inspections is small in relation to the approximately 1,400,000 pleasure craft in Canada. Further, powers to board and inspect small vessels are not being employed.

Conclusions

6.39 In view of the fact that United States Coast Guard studies show that boardings and, when appropriate, follow-up enforcement action is a highly effective measure, the Team is of the view that consultations should be undertaken with the Solicitor General, the RCMP and Provincial Attorneys General to increase inspections and enforcement actions, and that additional federal resources should be made available so that steamship inspectors can exercise their powers to enforce small boating regulations.

Promoting and Educating

Objective

6.40 "To make the public aware of marine SAR prevention measures".

Descriptive Profile

General

6.41 During the course of interviews for this evaluation, several people used the phrase "Education is the Key". The provision of information and the promotion of its use is essential to safe boating operations and the prevention of SAR incidents, and provides the impetus for producing an attitude of conscientious boat operations.

6.42 Education can be divided into two main categories; that associated with regulation, that is, information on current regulations, systems and structures for the operation of the craft; and information related to making this operation safe. Promotion involves the encouragement of the proper use of this information.

6.43 Education materials such as pamphlets and films are prepared primarily for marine safety programs. In many cases, the message being delivered will also forestall the occurrence of a SAR incident, if properly applied. For example, a promotion campaign aimed at preventing overloading of small boats could prevent a SAR incident with this cause. Information on the dangerous practice of failing to vent bilges when refueling, however, would not be likely to prevent a SAR incident, but could prevent a serious accident at a dock facility. The techniques of information delivery for safety and SAR preventive education are virtually identical, differing only in focus.

National Marine Safety Education

6.44 The Canadian Coast Guard SAR division recently introduced the film, "Coming Back Alive", which is aimed at small boat users in inland waters. This film received many favourable comments. Displays at major boat shows and media promotion are presented in conjunction with the DOT Public Information Office. The Coast Guard also sponsors a grant of $200,000.00 (with a proposed increase to $250,000.00 in 1982/83) to the Canadian Red Cross to assist in their Small Craft Safety Program. A liaison has been established with the Red Cross to avoid duplication of effort.

6.45 The Canadian Red Cross Mobile Safety Units operate in a similar fashion to BOSDET groups, providing a focus for information and demonstration at such places as parks, campgrounds, shopping areas and schools. Some provinces operate "Safety Lanes", a courtesy boat examination process often provided with RCMP participation.

6.46 Each provincial Red Cross group provides education and training in the safe handling of small boats, including canoes, rowboats and motor boats powered under 10 h.p. The Red Cross has produced a film on canoe handling.

6.47 A key element in the Red Cross approach to safety is a co-ordination structure called the Small Craft Safety Committee. Each province has such a committee which is used to co-ordinate the activities of Red Cross and groups with similar services such as Coast Guard, RCMP and provincial agencies. There is a national committee which is concerned more with policies and promotes discussion among organizations with a role in water safety. Through this committee the Canadian Coast Guard and Red Cross have discussed the joint provision of national seminars on boating safety that would parallel those that take place on an annual basis in the United States.

CCG Activities and Outputs

6.48 In the regions, CCG BOSDET (Boating Safety Detachment Team) units provide demonstrations of safety equipment and procedures to a variety of public groups. These same units are involved in scheduled school visit programs, run by all CCG regions except Laurentian, which does, however, include schools in visit schedules. Safety information is distributed at these functions.

Table 1 - Marine SAR Prevention Outputs and Costs

	1977/78	1978/79	1979/80	1980/81
No. of Courses and Demonstrations given	269	517	1,309	1,838
No. of Persons Participating	12,705	24,933	490,346	747,534
Headquarters Functional Administration Cost ($000)			603.2	424.8
Total Prevention Cost ($000)			1,127.2	958.9

Source: CCG OPMS

Table 2 - Information Distribution

6.49 At the present time, the CCG SAR Division is co-ordinating the publication of all safety related information pamphlets and brochures for the use of pleasure craft operators and fishermen. They include:

PUBLICATION	ANNUAL PRODUCTION
Canadian Boating Handbook	1,000,000
Manual of Safety and Health for Fishermen	12,500
Safety Equipment of Pleasure Craft (4)	500,000
Staying Afloat (Lifejackets, PFD's)	12

Source: CGVR

6.50 Within the federal government, two departments are directly involved in this activity and a third less so. In DOT/CCG, both the Ship Safety Branch and CGVR are involved in SAR prevention and education as part of their respective functions. DFO is also heavily engaged in prevention and education for fishermen and the RCMP performs a useful education function covering those inland parts of Canada where it is the police force.

6.51 Many international and national bodies such as the International Maritime Consultative Organization (IMCO), the Red Cross, the Canadian Yachting Association and the Canadian Power Squadrons all contribute to some degree in the promotion of safety awareness.

Observations

6.52 With respect to the outputs produced in this activity, it was observed that:

(a) There is no common forum for determining the methods and means of promoting and educating the SAR clientele in SAR prevention.

(b) Promotion and education in SAR sub-areas is not always directed at the clientele who cause the accident.

(c) BOSDETS, in some regions, visit inland areas to promote SAR prevention, perhaps duplicating efforts of other agencies.

(d) Crews at lifeboat stations are not involved in promoting and educating for SAR prevention.

(e) CMRA is not yet involved in promotion and education or in Courtesy Inspections.

(f) The effectiveness of the promoting/education SAR prevention sub-activity is not measured.

(g) Some information necessary to design, target and evaluate promoting/educating activities effectively is not gathered in SARSTATS or through other information sources. This information includes root causes of incidents and data concerning the vessel operator.

(h) Except for post-awareness studies conducted by advertisers following a boating safety media campaign, little analysis is conducted on the nature of SAR prevention target populations.

(i) Although no statistical information is gathered concerning operators involved in SAR incidents, the expert opinion is that operators of pleasure craft most frequently involved are those who believe that recreational boating requires little knowledge or training. This population is less likely to belong to a yacht club or to dock their craft at marinas.

General Observations

6.53

(a) Information gathered for designing and directing education/promotion activities is insufficient to identify accurately most causes and vessel operator characteristics. Effectiveness evaluation of education/promotion is also difficult through the lack of this and similar information.

(b) It is difficult to measure the effectiveness of the promoting and educating subactivity. There is, nevertheless, potential for better delivery of this information to the marine SAR target population through improved co-ordination with the MSAC at headquarters and through training volunteers, CMRA members, and other involved persons at the regional level by establishing a network for direct information delivery.

(c) Because there is little analysis on the nature of SAR prevention causes and target populations, Coast Guard regional prevention staffs have evolved their respective programs on the basis of local experience. No overall preventive policy guidance has been provided.

(d) Since the major portion of the target population for marine SAR prevention is unlikely to belong to yacht clubs or marinas, the Canadian Coast Guard does not deliver direct prevention education and promotion efforts to the target population. Fishermen are a prime example in some areas.

Conclusions

6.54 The Team concluded that some of the effort going into BOSDET activities could be more usefully expended on improving the co-ordination of the safety education efforts provided by the CMRA and other organizations and on training to educate, rather than educating the public directly.

General Observations on CCG SAR Prevention Structure

6.55 The CCG has structured delivery of the Canadian marine safety programs towards ensuring that an adequate level of safety is provided for the national marine transportation system, corresponding to its objective in this regard. The following Team observations pertain to this aspect and marine SAR prevention overall.

(a) Because CCG safety programs are constructed and delivered in support of the national marine transportation system, activities are aimed largely at commercial operations. Since recreational boating is, implicitly at least, not considered part of the national marine transportation system and since the majority of SAR incidents involve this group, SAR prevention programs have evolved outside the departmental safety structure with no co-ordination of policy development.

(b) Since the Ship Safety Branch of the CCG is structured to deal with the major sub-activities of accident prevention, it would appear that more effective SAR prevention programs could be achieved through enhancement of Ship Safety Branch to include SAR prevention, rather than vesting this responsibility totally with the SAR division of Fleet Systems Branch.

(c) Because of the similarity in design and delivery of accident prevention and SAR prevention programs, responsibility for SAR prevention should rest with the Canadian Coast Guard and, in particular, with the Ship Safety Branch, which is best structured to undertake all aspects of marine prevention.

(d) The SAR division of Fleet Systems Branch of the CCG should be responsible for the identification of SAR prevention target populations, based on analysis of SAR data; for identification of causes of SAR incidents, based on increased investigative efforts and analysis; for informing Ship Safety Branch of this SAR-oriented information; for planning with Ship Safety Branch at the regional level for possible shared delivery of safety and SAR prevention programs; and, in general, for co-ordinating the identification of the SAR requirements related to marine accident prevention.

Conclusions

6.56 The Team believes an appropriate and effective division of responsibility would be for a new Small Craft Division in the Ship Safety Branch to lead in the design and delivery of SAR prevention measures. The SAR Division would identify the target populations for SAR prevention and the causes of SAR incidents. It would also co-operate with Ship Safety in the field for the delivery of SAR prevention measures, in which SAR vessel crews would continue to be involved.

SECTION 7 - RESPONSE TO EVALUATION ASSESSMENT ISSUES

7.1 In response to the evaluation issues stated in the introduction to this Part, the observations shown in previous sections of this Part and other Parts clearly indicate that "it is likely that widened aviation and marine regulations, a broadened safety education program and increased enforcement actions, singly or together would produce effects that should reduce the occurrence of SAR incidents and consequently, decrease the demand for SAR operations resources. Moreover, targetting these programs at the owners and operators of small commercial and private aircraft and at marine pleasure craft and fishing vessel owners and operators could be an effective strategy for the federal government to adopt".

7.2 In the latter respect, the Team found that the following segments of the target population require priority attention for improved SAR prevention measures:

(a) Aviation

(1) Inexperienced Canadian and US private licensed pilots who fly single-engined aircraft for recreation and business purposes in British Columbia, Ontario and Québec;

(2) Commercial operators and pilots who fly single and small twin-engined fixed wing and helicopter type aircraft for charter purposes in British Columbia and Ontario;

(b) Marine

(1) Pleasure craft operators located in the southern coastal areas of British Columbia and in the southern Great Lakes and Upper St. Lawrence River areas;

(2) Fishing vessel operators located in the Atlantic provinces and British Columbia coastal areas.

7.3 For the issues of regulation, safety education and enforcement, the Team found that improvements are needed in the following specific areas:

(a) Regulating

Aviation

(1) Qualification standards are required for ground instructors who teach student civil pilots.

(2) Standards to assure that private and commercial licensed pilots have a basic knowledge of meteorology and personnel survival require strengthening.

(3) Standards and tests are required for maintaining the currency of a private pilot licence.

(4) Special standards are required to license private pilots to fly in mountainous and sparsely settled areas.

(5) Criteria for and geographic borders separating settled from sparsely settled areas as defined in ANOV-12 require revision.

(6) Flight preparation, notification, progress reporting, closure and enroute minima standards for flights conducted under visual flight rules require strengthening.

(7) The scope and frequency of inspections to assure compliance with personnel survival and ELT standards require extension.

Marine

(1) Standards are required for the licensing of pleasure craft and the certification of their operators.

(2) Co-ordination of the licensing of fishing vessels and certification of their operators among DOT, DFO and DOC is required.

(3) Standards are required covering each SRR for the types of clothing and equipment necessary to sustain life until the arrival of a response vehicle.

(b) Promoting/Educating

Aviation

(1) Full co-ordination and co-operation is required between DND, DOT/CATA and private sector aviation safety promotion organizations interested in SAR prevention.

(2) DOT/CATA and DND aviation safety promotion establishments require expansion so that the full SAR target population can be educated in SAR prevention.

(3) DND and DOT/CATA aviation SAR prevention promotion and education projects should be augmented by using the professional resources of other government and private sector aviation organizations.

Marine

(1) The Marine Safety Advisory Committee should co-ordinate and develop improved ways and means of achieving marine SAR prevention promotion and education objectives.

(2) Target populations should have priority attention for education rather than the entire client population.

(3) Augmentation by professionals from other government and private sector organizations is required for education in marine SAR prevention.

(c) Enforcing

Aviation

(1) Deliberate breaches of flight planning, enroute weather minima and personnel survival regulatory standards require vigorous enforcement.

(2) DOT/CATA enforcement specialist staffs require bolstering in target population regions.

Marine

(1) Spot compliance inspections of target population craft, particularly in high density areas are required.

Additional Issues

7.4 The Team found that two additional issues emerge from the observations and conclusions made in previous sections of this Part. First, improvements are needed in investigation of aviation and marine SAR incidents and second, SAR prevention activity objectives and levels of service need specification.

(a) Investigating

Aviation and Marine

(1) Complete recording is required of vital facts surrounding the occurrence of each SAR incident.

(2) Investigation analysis capabilities are required to determine cause factors and corrective measures for SAR incidents.

(3) SAR incident investigation reports should have wider distribution within government and the private sector, most notably in target population regions.

(b) Objectives and Levels of Service

(1) For aviation and marine SAR prevention objectives and levels of service, Table 7-1 depicts the Team's perception of federal government SAR organizational tasks and goals or standards with applicable sources or means of delivering required prevention services.

Cost Estimates

7.5 The Team has not found it possible, because of time constraints, to estimate the costs and other implications of most of the improvements required, particularly with regard to widening regulations. However, in the Team's judgment, some significant and effective improvements could be implemented at modest cost as an initial positive response to resolving many issues. Improvements that can be made and which are considered practical and effective at this time, from a federal government standpoint, are as follows:

(a) Establish SAR incident investigation and analysis units in CATA and the CCG consisting of at least one analyst in each organization.
TEC - 100 K dollars (1981/82)

(b) Establish a SAR Prevention Co-ordination position at DOT/CATA Headquarters to be added to the Co-ordination (CAII) establishment.
TEC - 50 K dollars (1981/82)

(c) Based on target population segments and their relative size and location, add at least four RASO and four enforcement specialist positions to be divided among DOT/CATA Pacific, Ontario and Quebec regions to handle civil aviation SAR prevention promotion/education and enforcement activities.
TEC - 400 K dollars (1981/82)

(d) Add at least eleven steamship inspectors to be divided between DOT/CCG Headquarters and Regional Ship Safety offices to handle marine SAR prevention enforcement activities.
TEC - 600 K dollars (1981/82)

(e) Estimated total annual costs:

22 PYs and 1,150 dollars (1981/82)

(This amount represents approximately one percent of current estimated O&M expenditures on SAR operations.)

TABLE 7-1

SAR PREVENTION LEVELS OF SERVICE

ACTIVITY	ACTIVITY OBJECTIVE	TASKS	GOALS OR STANDARDS	SOURCES/MEANS OF DELIVERING
INVESTIGATING	To determine the causes of all aviation and marine SAR incidents.	(a) To investigate and analyse the circumstances and conditions of each SAR incident.	(a) To ensure that the factors surrounding the occurrence of each SAR incident are evaluated.	(a) DND/DOT SAR reports and DOT Accident/Casualty Investigation and enforcement reports, police reports, coroner reports as applicable.
		(b) To develop and co-ordinate the distribution of SAR incident cause assessments and deficiency correction proposals.	(b) To ensure that basic cause(s) of each SAR incident are established, prevention deficiencies and corrective measures are identified and investigation findings and recommendations are reported in a timely manner to applicable regulatory authorities.	(b) SAR incident investigation reports.
		(c) To monitor the implementation of proposed corrective measures and to report disparities to SAR authorities.	(c) To ensure that SAR investigation report recommendations are actioned properly by applicable regulatory authorities.	(c) DOT SAR incident investigation and safety regulation implementation and enforcement actions.
REGULATING	To provide essential SAR prevention standards for aviation and marine vehicles, equipment and personnel including personnel survival standards.	(a) To formulate and co-ordinate SAR prevention requirements and standards.	(a) To ensure that SAR prevention requirements are available for inclusion in related aviation and marine safety standards.	(a) DOT/DND aviation and marine safety documents.
		(b) To participate in the review and development of SAR-related aviation and marine safety laws, rules, regulations, orders, directives and procedures.	(b) To ensure that SAR prevention inputs are provided with respect to safety standards change proposals for aviation and marine vehicle equipment and personnel.	(b) Aviation and marine safety councils, committees and task forces and internal regulation development bodies.
		(c) To conduct random inspections of aviation and marine vehicles, equipment and personnel in conjunction with applicable safety inspections.	(c) To ensure that clients are knowledgeable with regard to personnel survival procedures and equipment; to ensure the availability of such approved equipment and to ensure that such equipment is carried by clients during flight or voyage.	(c) DOT aviation and marine safety inspections.

TABLE 7-1 Cont

ACTIVITY	ACTIVITY OBJECTIVE	TASKS	GOALS OF STANDARDS	SOURCES/MEANS OF DELIVERING
ENFORCING	To ensure compliance with aviation and marine SAR prevention standards.	(a) To analyze SAR incident and other SAR related safety reports.	(a) To ensure that all infractions of aviation and marine SAR prevention standards are detected and that implications are identified.	(a) DND/DOT SAR incident reports DOT accident/incident and safety inspection reports, police reports and insurance underwriter reports, if available.
		(b) To communicate the consequences of detected infractions of SAR prevention standards to the responsible enforcement authority.	(b) To ensure that the responsible enforcement authority is informed in a timely manner of infractions of SAR prevention standards and of the implications arising from these infractions.	(b) SAR incident evaluation reports.
		(c) To monitor the implementation of SAR prevention enforcement measures by the responsible enforcement authority.	(c) To ensure that the responsible enforcement authority approriately actions reported infractions of SAR prevention standards.	(c) DOT enforcement actions and judicial civil and criminal enforcement actions.
PROMOTING/ EDUCATING	To make the aviation and marine publics aware of SAR prevention measures.	(a) To develop, coordinate and conduct national and regional SAR prevention awareness programs.	(a) To ensure that national and regional SAR prevention awareness programs are established and meshed with aviation and marine safety awareness programs.	(a) DND/DOT, other government agencies and private sector safety awareness projects.
		(b) To obtain information on the numbers and characteristics of the client population who are exposed to applicable SAR prevention awareness programs.	(b) To ensure that complete records are kept about clients who are exposed to SAR prevention awareness programs.	(b) DOT aviation and marine safety (RASOs and BOSIETs) and SAR prevention promotion presentations (DND defensive flying).
		(c) To target SAR prevention awareness programs at selected segments of the client population.	(c) To ensure that SAR prevention awareness programs are aimed at those segments of the aviation and marine client population who are most likely to generate SAR incidents.	(c) DOT/DND aviation and marine safety promotion visit and briefing schedules and safety information distribution systems.

CASE STUDY - ENFORCEMENT
SAR [redacted]

MFK 006 2 403 55
JJ CYHQYV
232010 CYTRYX
TO [illegible]HQ OTTAWA/LIOA
FROM ATCHQ TRENTON STOP
PART ONE OF TWO PARTS
COMD 57
SUBJE: UNNECESSARY SAR ALERT - SAR [redacted] 80
REFS: A. EDMONTON RCC [redacted] ("7,'-4/SAR [redacted]
B. EDMONTON BCOMD [redacted]

1. FOLLOWING IS A REPEAT OF REF B WHICH REQUEST THAT REPRESENTATION BE MADE TO MOT OFFICIALS TO ENSURE THAT APPROPRIATE ACTION IS TAKEN AGAINST MR [redacted] IN REGARD TO VIOLATIONS OF AIR REGULATIONS WHICH CAUSED A CONSIDERABLE LEVEL OF UNNECESSARY SAR ACTIVITY. QUOTE

1. AS YOU MAY BE AWARE SAR [redacted] ACTIVITED SEVERAL RESOURCES FROM THIS BASE INCLUDING ONE CC130, TWO CC 138, SEARCH HQ AND OTHER PERSONNEL RESOURCES INDIRECTLY - UNNECESSARILY

2. [redacted] DEPARTED [redacted] MAN, ENROUTE TO FILED DESTINATION OF [redacted], SASK. HE REPORTEDLY FLEWDIRECT ROUTING THROUGH WINNIPEG CONTROL AREA, PORTAGE MIL CONTROL ZONE, BRANDON CONTROL ZONE AND TERMINATED AT [redacted], WITHOUT ANY RADIO COMMUNICATION WITH ABOVE AGENCIES WITHOUT ADVERTISING CHANGE OF DESTINATION OR WITHOUT CLOSING FLIGHT PLAN. AIRCRAFT WAS FINALLY LOCATED BY RCMP AM 12 JUL BUT NOT BEFORE APPROX 15 FLYING HOURS BY CC 130/CC 138 EXPENDED SEARCHING AND IN TRANSIT TO SEARCH AREA

3. IN DISCUSSION WITH MOT REPRESENTATIVES EDMONTON WHO SHARE CONCERN FOR GROSS IRRESPONSIBILITY DISPLAYED BY [redacted], IT HAS BEEN LEARNED THAT [redacted] HAS BEEN DIRECTED BY WINNIPEG MOT AUTHORITIES TO PROVIDE REASONS FOR HIS ACTIONS AND/OR LACK OF ACTIONS. ON ASSUMPTION THAT HIS REASONS WILL NOT JUSTIFY HIS ACTIONS. INDICATIONS ARE THAT [redacted] WILL LIKELY RECEIVE ONLY 30 DAY SUSPENSION OF LICENSE

4. I AM CONCERNED THAT LACK OF APPROPRIATE DISCIPLINARY ACTION WILL
END OF PART ONE OF TWO PARTS

CASE STUDY - ENFORCEMENT
SAR [redacted]

MFK 007 2 403 59
JJ CYHQYV
232010 CYTRYX
FINAL PART OF TWO PARTS

EXACERBATE AN ALREADY DETERIORATING SITUATION OF PRIVATE PILOTS IGNORING REGULATIONS AND THEREBY JEOPARDIZING SAFETY OF INNOCENT PEOPLE AND WASTING TAX DOLLARS. IT IS APPARENT THAT DISCIPLINARY ACTION IN THIS CASE, WHICH IS CLASSIC EXAMPLE OF GROSS IRRESPONSIBILITY DOES NOT SERVE ANY PURPOSE WHATSOEVER SINCE PRESUMABLY [redacted] IS PRIVATE PILOT WHO LIKELY DOES NOT FLY ONCE EVERY 30 DAYS. IT MAY BE THAT LEVEL AT WHICH DISCIPLINARY ACTION IS BEING TAKEN IS NOT SUFFICIENTLY HIGH TO AWARD APPROPRIATE PUNISHMENT. IT WOULD NOT APPEAR UNJUST FOR [redacted] TO LOSE LICENSE FOR GREATER PERIOD SAY SIX MONTHS, BE AWAREDED SUBSTANTIAL FINE OR BE ORDERED TO PAY PORTION OF COSTS INVOLVED FOR ASSIGNED FEDERAL RESOURCES AS WELL AS BE SUBJECT OF PUBLICITY IN LOCAL AND/OR REGIONAL NEWSPAPER. ONLY BY THESE ACTIONS WILL SUBJECT PILOT ENSURE HIS FUTURE ACTIONS ARE MORE RESPONSIBLE AND OTHER PILOTS RECOGNIZE FULL IMPLICATIONS OF THEIR ACTIONS OR LACK OF SAME

5. ACCORDINGLY I REQUEST THAT SUBJECT CASE BE DISCUSSED WITH MOT OFFICIALS IN ATTEMPT TO ENSURE APPROPRIATE DISCIPLINARY ACTION IS TAKEN ON THIS MATTER AND HOPEFULLY TO ASSIST IN CURBING THE INCREASINGLY IRRESPONSIBLE MANNER IN WHICH MANY PRIVATE PILOTS APPEAR TO BE TREATING RULES AND REGULATIONS DESIGNED FOR THE SAFE, EFFECTIVE AND EFFICIENT OPERATION OF AIRCRAFT IN CANADA. UNQUOTE

2. I SHARE BCOMB EDMONTON CONCERN. A VITAL COMPONENT OF AN EFFECTIVE NATIONAL SAR PROGRAM IS INCIDENT PREVENTION THROUGH WOULD NOT PROVIDE A SATISFACTORY SAR SERVICE IF INDIVIDUALS DO NOT FEEL COMPELLED TO OBSERVE RULES AND REGULATIONS DESIGNED FOR THEIR SAFETY

3. I THEREFORE REQUEST THAT OUR CONCERN OVER THE ADEQUACY OF PUNITIVE MEASURES TAKEN AGAINST FLAGRENT VIOLATORS OF REGULATIONS BE STRONGLY EXPRESSED TO THE APPROPRIATE OFFICIALS AT MOTHQ

END OF FINAL PART OF TWO PARTS

ANNEX IV-1

Government of Canada
Gouvernement du Canada

MEMORANDUM **NOTE DE SERVICE**

TO / À: A/LIC/L

FROM / DE: LICR/L

SECURITY - CLASSIFICATION - DE SÉCURITÉ	
OUR FILE/NOTRE RÉFÉRENCE	5802-236393 (LICR/L) 5003-10-28
YOUR FILE/VOTRE RÉFÉRENCE	
DATE	September 24, 1980

SUBJECT / OBJET: Enforcement - [redacted]

In light of DLI's interest in Mr. [redacted] violation of ANO V, No. 4 a brief report on the case follows.

On [redacted], 1980, Mr. [redacted], an inexperienced private pilot operating on a VFR flight plan, made an unnotified change in destination and failed to close his flight plan. He was reported overdue and an extensive search by DND resulted. Mr. [redacted] aircraft was eventually located by the RCMP at a farm airstrip.

CCAR instituted enforcement action on receipt of an infraction report and sent a letter of allegation to Mr. [redacted] on July 18, 1980. Meanwhile DND, incensed by the unnecessary search, sent a lengthy telex to CATA HQ alleging violations of the Positive Control Zone Order as well as paragraphs 6 and 9 of ANO V, No. 4 and exhorting DOT to take severe disciplinary measures. A copy was sent to CCAR.

DLI, on receipt of the telex communicated directly with the Regional Enforcement Specialist to the effect that a six month licence suspension would be in order if the violations of the Positive Control Zone Order were proved. No evidence was adduced to substantiate the latter aspect and CCAR imposed a warning on the basis of the violation of ANO V, No. 4.

Notwithstanding the resulting SAR activities, a warning is the normal response to a first violation of ANO V, No. 4. Lengthy suspensions are usually reserved as sanctions for violations having more direct flight safety implications. This is not to say that DND's concern is not well founded or that it should not be supported by stronger deterrent measures. Perhaps some educational measures such as publicity, posters, an Information Circular, and recorded messages should be proposed.

A R Pinder
A.R. Pinder
Superintendent, Enforcement

Transport Canada Transports Canada **ROUTE SLIP** ***BORDEREAU D'ACHEMINEMENT***

TO – *A* (NAME – *NOM*)	DESIGNATOR *SYMBOLE*
Mr. A. James	A/DLI/L

☐ For approval *Pour approbation*
☐ For *Pour* Signature
☐ Comment *Observations*
☐ For your *Pour votre* information
☐ Per our *Selon notre* Conversation
☐ Discuss with me *Discuter avec moi*
☐ Take appropriate action *Prendre les mesures appropriées*

RECEIVED IN DLI
REÇU PAR DLI
SEP 30 1980

REMARKS – *REMARQUES*

Enforcement - [redacted]

Reference is made to LICR's memorandum of Sept. 24-80, and DLI's route slip of July 27-80.

I agree with ATCHQ's concern on such cases, but a letter of warning only was sent to the pilot, a practice normally exercised in such cases. Therefore, there would be little to be gained from publicizing the case (from the penalty aspect) in view of the light penalty imposed.

I would suggest a review be made of the present pilot knowledge requirements in the area of reporting and closing of flight plans, and provide for greater penalties when the regulation in question is breached.

We should also explore the possibility of issuing educational bulletins to pilots.

FROM – *DE* Signature	Date	Telephone – *Téléphone*
J.E.Lafontaine A/LIC	25.9.80	2-5755

02-0091(4-78)

ANNEX IV-1

Government of Canada Gouvernement du Canada

MEMORANDUM NOTE DE SERVICE

O
A

PCA - Vancouver OCA - Willowdale
WCA - Edmonton QCA - Dorval
CCA - Winnipeg ACA - Moncton

ROM
DE

DCCA/DDC/L - Ottawa
K1A 0N8

SECURITY - CLASSIFICATION - DE SÉCURITÉ

OUR FILE/NOTRE RÉFÉRENCE 5003-10-1 (LICR/L)

YOUR FILE/VOTRE RÉFÉRENCE

DATE November 5, 1980

SUBJECT
OBJET
Enforcement: Violations of ANO Series V, Number 4
Flight Plans and Flight Notifications Order

The rising rate of enforcement actions with respect to ANO Series V, Number 4, casts doubt on the efficacy of CATA efforts at achieving compliance in this area. Statistical analysis for the past three years is shown below.

Year	Deterrent Actions
1977	11 (3.3% of all actions)
1978	27 (5.0% of all actions)
1979	42 (6.9% of all actions)

Data for 1980 is incomplete but a projection based on reports received so far (20) indicates that the rate continues to increase. All but eleven of the cases listed (89%) were concluded with warnings or cautions.

Of particular concern are violations of sections 6, 7 and 8. Failure to report arrival is likely to cause unnecessary search and rescue action. For example, as a result of an overdue aircraft report, a search and rescue unit recently launched one CC130 and two CC138 aircraft. The pilot had neglected to file an arrival report. The aircraft was eventually located on an aerodrome by the RCMP but not before 15 flying hours had been expended by SAR aircraft. This sort of situation not only constitutes a needless expenditure of SAR resources but also carries the hazard of diverting those resources from actual emergencies.

.../2

JKD/dlb

Since the general use of warnings and cautions has evidently been of limited value in deterring violations of ANO Series V, Number 4, you are requested to examine your enforcement responses with a view to ensuring that a positive deterrent effect is achieved. Where the evidence warrants, licence suspensions or court prosecutions should be considered appropriate, for first as well as subsequent offences.

In addition, you should consider the use of whatever promotional measures that are available to encourage adherence to the provisions of ANO Series V, Number 4. These could include educational endeavours under the auspices of the RASO and the publicizing of enforcement actions through the local media. Meanwhile, a reminder about the importance of arrival reports will be published in a forthcoming Aviation Safety Letter.

Original Signed by
[illegible] par
Deputy [illegible]
Directeur [illegible] Aeronautics
Ci[illegible] Aéronautique

ANNEX IV-1

Copy to: J.K. Dumont

JKD/dlb

5003-10-1 (LICR/L)

Ottawa, Ontario
K1A 0N8

November 7, 1980

Chief of Defence Staff
National Defence Headquarters
Ottawa, Ontario
K1A 0K2

Attention: DARTS 2

Dear Sir:

Owing, in part, to the concerns recently expressed by your Department, a memorandum respecting enforcement of the Flight Plans and Flight Notification Order was sent to all Canadian Air Transportation Administration Regions.

A copy is attached for your information.

Yours truly,

ORIGINAL SIGNED BY
F. M. [illegible]
[illegible]

F.M. Murphy
for Acting Chief
Aeronautical Licensing Division
Aeronautical Licensing and
Inspection Branch

Attach.

Annex IV-2

ROYAL CANADIAN MOUNTED POLICE

NUMBER OF MARINE PREVENTION ACTIONS AND SUCCESS RATE

Statistics for fiscal year ending 31, March 1981

Personhours spent enforcing Canada Shipping Act and on Water Safety Program (W.S.P.).

39,011 hours on enforcement - 8528 hours on W.S.P.

This included over 300 educational presentations with audience exposure in excess of 505,000 people.

Number of reported or known offences to police	Unfounded	Actual Number
4,520	51	4,469

Statistics for fiscal year ending 31, March 1980

Personhours spent enforcing Canada Shipping Act and on Water Safety Programs (W.S.P.).

36,041 hours on enforcement - 9,660 hours on W.S.P.

This included over 360 educational presentations with audience exposure in excess of 85,000 people

Number of reported or known offences to police	Unfounded	Actual Number
4,451	25	4,426

Annex IV-3

ROYAL CANADIAN MOUNTED POLICE

The 1980 record for boating inspections and warning tickets issued under the Small Vessel Regulations (S.V.R.) of the C.S.A.

DIVISION		INSPECTED	(S.V.R.) Warning Tickets
A		4,018	291
B		1,269	409
C		9,158	1,269
D		3,096	395
E		8,034	784
F		5,878	783
G		461	79
H		4,020	570
J		1,425	144
K		9,318	1,713
L		258	65
M		249	2
O		335	7
	Total	47,519	6,511

PART V - ACTIVITIES IMPINGING ON SAR

SECTION 1 - INTRODUCTION

1.1 The outputs, impacts and effects of associated safety activities which impinge on all SAR activities are displayed in the Evaluation Assessment logic diagram. In this connection, the Team judged that those safety activities which produce navigation and weather services merit evaluation preference to other impinging program activities. These activities and their services directly assist aviators and mariners in the safe conduct of flights and voyages and also directly assist in achieving SAR operations and prevention objectives.

1.2 For aviation, DOT/CATA and to a lesser degree DND, produce air navigation services including air traffic and aeronautical information services which are essential to SAR. Weather services are provided by Environment Canada AES in conjunction with DOT/CATA and DND.

1.3 Similarly, in the marine environment, DOT/CCG provides navigation services such as Aids to Navigation and Vessel Traffic Management. DOT/CCG and AES provide marine weather services.

1.4 The federal government facilities which provide aviation and marine navigation and weather services are equipped and linked with respective aviation and marine telecommunication systems which are jointly shared in some areas.

SECTION 2 - ASSOCIATED ACTIVITIES - AVIATION

AIR TRAFFIC SERVICES

Descriptive Profile

2.1 Air traffic control - The purpose of air traffic control (ATC) system in Canada is to assure the safe, orderly and expeditious flow of air traffic. ICAO Annex II is the base document for the provision of air traffic control service.

2.2 To meet ICAO objectives, the Canadian air traffic control system consists of:

(a) Area Control provided by area control centres (ACCs) to aircraft operating within specified control areas;

(b) Terminal Control provided by ACCs and terminal control units (TCUs) to aircraft operating within designated terminal control areas (TCAs);

(c) Airport Control provided by control towers to airport traffic in designated control zones; and,

(d) Terminal Radar Service provided by ATC units to aircraft operating within designated terminal radar service areas (TRSAs).

2.3 Flight Services. The purpose of the flight service system in Canada is to provide information to pilots. The Canadian system is established in accordance with ICAO standards. Outputs produced by this system consist of information pertaining to adverse weather, air traffic, aircraft position and direction finding. These services are provided mainly by DOT/CATA air traffic control units, flight service stations (FSS) and electronic air navigation aids. At uncontrolled airports (no control tower), FSS units also provide an airport advisory service to departing and arriving aircraft. These advisories include reported conditions at the airport and other information regarding air traffic. All FSS's provide air/ground communications, electronic navigation aids monitoring, aviation weather information, flight planning and SAR alerting services. This complete package of CATA flight services is available whenever practicable, either before departure or while in flight to all aircraft operating within ICAO designated flight information regions under Canadian jurisdiction.

2.4 Flight Planning - The main purpose of this system is to forewarn the air traffic control system that a pilot intends to utilize the ATC system. Also, it serves to record pilot intentions prior to flight, thus ensuring a response from the SAR system should the pilot encounter an emergency during flight or should he fail to arrive at his planned destination.

2.5 The flight planning system is designed essentially to accommodate two basic types of flight, those conducted under instrument (IFR) conditions and those conducted under visual (VFR) flight conditions. The IFR flight planning system, unlike the VFR planning system, caters to a relatively small portion of the client population. For example, at the end of 1980, some 7,700 Canadian licensed civil pilots out of about 58,000 were qualified to file IFR flight plans.

2.6 The seven area traffic control and 116 CATA flight service stations and their communications links are the hub of the VFR flight planning system which is available for use by the target population.

2.7 Alerting - The purpose of the alerting system is to conduct communication searches to locate unreported aircraft and to notify RCCs when an aircraft is overdue or in distress. This system in Canada is established in accordance with ICAO standards. It is chiefly provided by DOT/CATA ATC and FSS units. These units also are used to alert airport emergency, local ambulance and other related emergency service units and to relay information to the appropriate agency on marine emergencies, forest fires and other civil aid and humanitarian assistance emergencies.

2.8 Summary of Air Traffic Services Units and Aids. Tables 2-1 and 2-2 depict the current character, size and disposition of CATA air traffic service units as well as supporting ground based electronic air navigation aids.

Observations

2.9 For air traffic services, it was observed that:

Air Traffic Control System

(a) ATC coverage is not provided below 29,000 feet in the Arctic Control Area, or below 23,000 feet in the Northern Control Area, or below 18,000 feet in many of the more remote portions of the Southern Control Area. Although this airspace may not be controlled, air/ground communications are available in many parts of the north through the use of FSS high frequency and VHF communications equipment. It is a function of FSS units to relay ATC communications as required, both air to ground and ground to air. All FSS units are connected to the ACC responsible for the FIR in which they are located.

(b) Of about 2.3 million flight plans filed in 1980 with DOT/CATA and other agencies, approximately 1.8 million (78%) were followed by the ATC system through operation under instrument flight rules (IFR). Furthermore, of this annual number of 1.8 million IFR flights, the data shown in Table 3-4 of Section 3, Part IV, based on 5 years of information, indicates that only 21 (6%) out of 323 SAR-related accidents occurred when pilots were conducting enroute and terminal IFR flights utilizing ATC capabilities.

TABLE 2-1

CATA AIR TRAFFIC SERVICES FACILITIES

CATA Region	Area Control Centres (ACCs)	Terminal & Enroute Control Units (TCUs)	Control Towers	Flight Service Stations (FSSs)
Pacific	1	-	11	28
Western	1	1	12	31
Central	1	4	6	22
Ontario	1	3	13	13
Quebec	1	1	9	17
Atlantic	2	1	9	15
TOTAL	7	10	60	116

TABLE 2-2

CATA OWNED AIR NAVIGATION AIDS

	CATA REGION						
TYPES OF AIDS	PAC	WEST	CENT	ONT	QUE	ATL	TOTAL
EN ROUTE							
PRIMARY RADAR*	1	1	4	7	2	-	15
SECONDARY SURVEILLANCE RADAR (SSR)*	2	2	5	6	2	4	21
RADIO RANGE (LFR)	1	-	-	-	-	-	1
RADIO BEACONS (NDB)	58	78	81	45	67	39	368
VHF OMNI RANGE (VOR)	5	18	13	8	9	8	61
TACTICAL AIR NAV. (TACAN)	3	2	2	5	6	6	23
VORTAC (VORTACAN)	4	3	9	6	4	5	31
TERMINAL							
PRIMARY RADAR*	1	2	1	3	3	3	13
SECONDARY RADAR (SSR)*	1	1	1	2	2	1	9
VHF DIRECTION FINDING	DISTRIBUTION NOT AVAILABLE						61
			TOTAL				603

* RADARS HAVE TRANSPONDER FEATURE INCORPORATED TO RECEIVE DISTRESS CODE FROM AIRCRAFT EQUIPPED WITH A TRANSPONDER.

(c) Only 2,109 (4%) of the target population of some 50,000 private and commercial licensed pilots in Canada are authorized to fully utilize the enroute and terminal ATC system. Obtaining an instrument rating for private and commercial licensed pilots is costly in terms of training and experience requirements and IFR flight utilizing ATC is sometimes impractical for certain kinds of recreational or commercial operations. Also, some pilots may be precluded from IFR ratings because they do not possess the inherent capability to meet the stringent standards required for this type of flight although they may be safe in all respects so long as they maintain Visual Flight Rules (VFR).

(d) The ATC enroute and terminal control system can be utilized by the 50,000 pilots who are qualified to conduct flights under only visual flight rules (VFR) i.e. non IFR rated pilots, but there are ATC constraints on this type of operation which some private and commercial pilots either cannot be bothered with or will not tolerate.

Flight Service System

(e) FSS units both in Canada and the USA have the capability to contribute significantly to the prevention of SAR incidents, particularly for those flights not involving the air traffic control system i.e. VFR enroute flights outside controlled airspace and those within the local area of an uncontrolled aerodrome (no control tower).

(f) FSS areas of responsibility cover the entire land and waters of Canada but FSS capabilities are limited by a lack of adequate communications. The most notable weakness is the incapacity of FSS stations to accept and process VFR flight plans by telephone during peak periods of recreational and commercial flying particularly in urban areas such as at Toronto and Vancouver. At Buttonville Airport, for example, where some 250 private and small commercial aircraft are based, experts expressed frustration with the FSS system. It was said that some pilots, because of this problem, failed to file flight plans or check vital flight information before departure to destinations that often were located in remote or sparsely settled areas where limited weather information and other services were available. It is interesting to note that in response, DOT/CATA said that in the urban areas such as Toronto and Vancouver, the acceptance and processing of VFR flight plans is the responsibility of ATS-ACCs (References IFR/VFR Supplement listings for Toronto, Vancouver and Buttonville). The FSS so far has not been formally designated for this purpose at these locations.

(g) FSS units do not monitor the progress of VFR flights except between departure and final destination points. Moreover, FSS units contacted by VFR enroute traffic are not required to pass position reports, except for flight plan information changes either to the final destination FSS station or to a central monitoring facility such as an Area Traffic Control Centre.

(h) Forty-nine CATA FSS stations not co-located with ATC units are scheduled to have VHF direction finders by 1983. This should enhance the positioning of declared airborne emergencies and further enhance SAR operations.

(i) There are gaps in the deployment and coverage of electronic air navigation aids, particularly to assist IFR and VFR flights at lower altitudes where most of the target population operates and in certain areas such as north of Vancouver Island, in the interior of British Columbia and in northern regions.

(j) There still is a small percentage of CATA certified private aircraft which lack either radio receivers or other air navigation aid receivers but which CATA permits to fly on VFR enroute flights.

(k) Some private companies who operate and maintain their own air navigation aids do not wish to announce publicly the location and frequencies of their aids.

Flight Planning Systemn

(l) CATA does not formally encourage private pilots to file VFR flight plans in advance of potential heavy traffic situations such as occur on weekends in the summer months. Instead, CATA requirements are such that a pilot can file a flight itinerary with a responsible person in lieu of a flight plan. It is difficult for private pilots wishing to file a flight itinerary to contact flight planning agencies in some urban areas either to open or close VFR flight plans. This situation creates, in private pilots, a sense of apathy and sometimes hostility towards the flight planning system. In response, DOT/CATA advises that a flight planning review committee has been established by DGCA and has recommended required improvements at urban centres.

(m) Of the 323 SAR related accidents described in Part IV Section 3 - Aviation Target Populations, the Team observed that pilots in 71 (22%) cases did not bother to notify the flight planning system of their intentions, indicating a significant disregard for the system by these pilots as well as disregard of flight planning requirements specified in CATA ANO V-4.

(n) FAA regulations permit visual flight on top of cloud, provided ascent and descent is conducted in accordance with Visual Flight Rules. This kind of flight is not permitted by CATA but it is often conducted by US private pilots flying in Canadian airspace particularly those flying to the interior of British Columbia.

Experts consider this situation a serious safety hazard as well as a potential source of a SAR incident.

General Observations

2.10 These observations and descriptive profiles in Part IV and this Part lead to the following general observations about air traffic services and the achievement of SAR prevention objectives:

(a) As matters now stand, target population pilots are mainly reliant on flight service station units for air traffic services. These units do not provide an enroute VFR flight following service. This lack of service can produce undue delay in SAR response and increase the area of search required.

(b) The rules, regulations and orders governing the conduct of enroute visual flight require revision. The work of the CATA Aeronautics Task Force in this area, as explained in Part IV, section 4, paragraph 4.43, should ensure a higher level of SAR prevention.

Conclusions

2.11 The lack of an enroute flight following service for pilots flying under Visual Flight Rules contributes to notification delays and expands the area which must be searched. Since notification times exceed response times, the Team believes that rules, regulations and orders governing visual enroute flight require revision and that the work of the CATA Aeronautics Task Force in this area should be given priority. Moreover, CATA should take appropriate measures to increase capacities to accept VFR flight intentions during peak flying periods.

Aeronautical Information Services

Descriptive Profile

2.12 Part of safety and SAR prevention activities is conveying information that will provide an individual with knowledge of the facilities, systems, procedures and standards which will contribute to a greater understanding of the vehicle and the environment in which it operates, and hence contribute to overall aviation safety and the prevention of SAR incidents.

2.13 Aeronautical information services generally can be classified into two broad categories; firstly, that of a pre-flight or reference nature not subject to frequent revision nor required to be carried on the aircraft and secondly, that of an in-flight nature, subject to frequent revisions and carried on the aircraft. The first category can be broken down into regulatory, administrative and flight planning information. The second category can be broken down to that of information primarily of interest to the operators of aircraft flying under VFR and IFR conditions.

2.14 The reference information (regulatory and administrative) includes Air Regulations, Air Navigation Orders, Civil Aviation Handbooks, Flight Planning and Procedures Canada and North Atlantic and AIP Canada. The in-flight information includes: VFR Visual Navigation Charts, VFR and Northern Supplements, Water Aerodrome Supplement, IFR Terminal Area Charts, IFR Radio Navigation Charts, Canada Air Pilot (Terminal Procedures) and the IFR Supplement. All of this primary information is supported by an information sub-system which includes: Class I NOTAM (notice to airmen); Class II NOTAM, Aeronautical Information Circulars and Aviation Notices.

2.15 An Interdepartmental Committee on Aeronautical Charting (ICAC) is responsible for the co-ordination and overview required to advise the government on Canadian aeronautical charting, policy and liaison with other governments. This Committee is composed of representatives of TC, DND and EMR. The Director of Aeronautical Standards and Legislation is the Chairman of this Committee.

2.16 Within CATA, the Aeronautical Information Service (AIS) Division of DSL is responsible for the co-ordination of the AIS through the multi-department organization for collecting, validating and disseminating civil aeronautical charts and related flight information products. The division is also responsible for the assignment and control of Canadian location identifiers and aircraft operating agency designators, and for the control, production and distribution of notices to airmen (NOTAM), information circulars, aviation notices and all operational publications.

2.17 DND is responsible for collecting and validating military aeronautical information and defining the requirement for military aeronautical information products. EMR is responsible for producing aeronautical information products and providing technical advice. EMR, through the Canada Map Office, is responsible for the distribution of all civil aeronautical charts and the previously listed information publications. The DSS prints and markets the following publications: Air Regulations and Aeronautics Act; Air Navigation Orders; Personnel Licensing Handbook; Air Service Fees Regulations; Engineering and Inspection Manual; Aircraft Log Component Section; Flying Training Manual; and Weather Maps.

2.18 Aeronautical information concerning air space and aeronautical facilities procedures, services and hazards is disseminated by three methods. The first and primary method is through the various series of aeronautical charts and chart supplements. The second is through the Class I NOTAM system using the automated data interchange system (ADIS) and by voice advisory using appropriate air-ground communication facilities, usually automatic terminal information service (ATIS), Tower Control Units, or the advisory services provided by the FSSs. The third method is through the Class II NOTAM Aeronautical Information Circulars (AIC) and Aviation Notices distributed by post.

2.19 Over the years, deficiencies were identified in the quality and method of distributing pre-flight reference information and in addition, Canada did not have a State Aeronautical Information Publication in conformance with ICAO standards and recommended practices. Accordingly, the Aeronautical Information Publication - Canada (AIP) was developed to serve as a single source, authoritative pre-flight reference publication for use by all Canadian and foreign pilots and navigators. The first edition of AIP - Canada became effective in 1980 and replaces the Flight Information Manual and the Flight Planning and Procedures Manual although the latter document continues to be produced by DND.

Observations

2.20 Aeronautical Information Publication System. Experts considered this system's outputs vital to achieving the objectives of aviation activities as well as the SAR prevention regulatory activity. In this regard, it was observed that:

(a) the client and target population of Canada are well served both by CATA and DND and by privately sponsored aeronautical publications. In particular, the scope and general quality of the CATA Aeronautical Information Handbook (AIP) which was recently issued to all Canadian licensed pilots was applauded by experts. In contrast, the FAA has no equivalent to the AIP in either distribution or quality and FAA officials expressed envy of this Canadian effort;

(b) US private pilots conducting flights in Canada generally are ill-informed on the rules, regulations and environmental factors which are special to Canada. CATA FSS units are set up to accommodate these needs, for instance by providing the AIP and other information at border points, but some US pilots fail to take advantage of this service through either ignorance or disinterest;

(c) CATA and DND regional staffs have made special efforts to publicize features that are unique to their regions but a national campaign directed at US and other foreign visiting pilots has so far not been implemented by either of these departments' national headquarters or through the Department of Industry, Trade and Commerce and its provincial counterparts.

Conclusion

2.21 Aeronautical information services provide pilots with information facilities, systems, procedures and standards. The Team has concluded that Canadian aeronautical information services are of a high calibre. However, stronger efforts are desirable to ensure that U.S. private licensed pilots, who are frequently involved in SAR incidents, have ready access to and use of Canadian aeronautical flight information publications before entering Canada.

Aviation Weather Services

Descriptive Profile

General

2.22 The acceptance of a practicable level of preventing SAR incidents and consequent resource dedication is predicated on a best available aviation weather information system in all phases from pilot training to major air carrier operations.

2.23 The federal government agency responsible for providing aviation meteorological services is the Atmospheric Environment Service (AES) of Environment Canada. In 1972, the Department of Environment was formed and responsibility for the provision of all weather including aviation weather services for Canadians was transferred to the AES from DOT/CATA. A Memorandum of Understanding (MOU) was established between the two departments at the time of separation. As part of the MOU, CATA agreed to provide the AES with detailed aviation weather requirements on an annual basis and to obtain from the Treasury Board the resources required to meet these needs. AES would conduct training, set the meteorological standards and provide the service, and CATA would reimburse AES for the services provided. In addition to AES and CATA, the Canadian Forces provide 19 weather units and four forecast centres co-located with the RCCs. DND pays AES for the incremental costs of meteorological equipment and communications. CF meteorology technicians are trained at the DND School of Meteorology, CFB Winnipeg.

Aviation Weather Systems

2.24 There are three basic systems under which aviation weather services are provided to the aviation publics in Canada.

(a) Aviation weather information service is provided in response to operational requirements in the Meteorological Requirements Index (MRI) as identified by DOT/CATA and DND. This service may be provided by AES weather stations directly or responsibility may be delegated to CATA Flight Service Stations or DND equivalents at locations requiring less than full technical presentation. AWIS is presented by Flight Service Specialists and Canadian Forces specialists trained and qualified by CATA, DND and AES. An AWIS Flight Service Specialist is qualified to present to the pilot a briefing on present and anticipated weather conditions for flights within a 500 N.M. radius of the FSS. Pilots anticipating flights of greater range are connected or referred by the Specialist to the nearest designated AES weather office for additional information. Any pilot with access to a public telephone has access to an aviation weather briefing, either through a local or long distance call to an AES facility or through a toll-free call to an FSS. Civil pilots have limited access to DND weather units and forecast centres.

(b) The Arctic Aviation Weather Reporting Stations (AAWRS) program provides service required to permit regular commercial air service to Arctic "B" and "C" airports which would not meet the normal MRI requirement criteria; and,

(c) The Private Aviation Weather Reporting Stations (PAWRS) program makes provision for the establishment of privately operated weather observing and reporting stations. These stations may be manned and operated by aircraft operators, municipalities or others, under the direction of AES in order to satisfy the requirements of operating certificates and to promote the safe conduct of air operations at sites which do not qualify for publicly funded weather stations.

2.25 CATA is involved only to the extent of approving locations and authorizing instrument approach procedures. AES provides technical advice on the selection, installation and maintenance of instruments and equipment. It provides manuals, instructions and forms, trains and certifies qualified observers, carries out periodic inspections and monitors the quality of the observing programs.

Observations

2.26 Aviation weather services are crucial to SAR prevention because serious effects can occur if target population pilots do not use them or do not understand that these services are available. In this respect, it was observed that:

(a) according to CATA, DND and private sector users, the overall reliability and accuracy of aviation weather forecasting has deteriorated significantly during the past two decades for flights conducted below 10,000 feet and to the smaller airports in Canada where the large majority of the target population operates. The existing criteria are directed primarily towards serving the larger air carriers (Class 1 and 2) who utilize the upper levels of airspace and the larger airports in Canada. In response to users, AES officials stated that over the past two decades, activity within the target population has expanded explosively with no concomitant expansion in the resources made available to AES to provide the service. A comparison of the resources for services to aviation in 1970 and in 1980 would show a decrease in real terms, in spite of an increase in the activity. Since Transport Canada (CATA) has the responsibility to specify in detail the requirements of aviation for weather service, then to obtain from the Treasury Board the resources required to meet those needs, it would seem more accurate to identify either CATA or TBS policy as the cause of any reduced service. One might even question whether or not the CATA decision some years ago to use less-well-trained Flight Service Specialists to provide the information to pilots (rather than the highly trained weather service specialists of the AES) has contributed to the perceived degrading of service.

(b) toll free telephone lines or collect calls to FSS units aid private and commercial pilots in gaining necessary aeronautical planning information before flight as well as essential weather information. However, use of FSS lines for detailed weather briefings at peak hours reduces pilot access to the FSS system when they wish to file or cancel flight plans;

(c) AES offices are required to respond to both environmental and weather information requests from the Canadian population at large. This effectively reduces the time available to answer aviation weather requests particularly from private pilots planning a flight. The effects of this overload were most serious during periods of marginal weather conditions;

(d) there are a significant number of CCG radio, AES, CF, AES contracted and private weather observing resources in Canada which are not accessible to private and commercial pilots but which could provide them with local observations and essential information on which to base a pilot deduced weather forecast. Two-way communications equipment and trained personnel would be required at these sites but the benefits to SAR prevention and aviation in general could be significant;

(e) AES weather information is transmitted mainly by teletype via circuits dedicated to specific geographical areas. Each weather facility may be connected to one or more circuits and all stations receive information on the circuit regardless of demand. Special reports, particularly those showing deteriorating and often dangerous conditions, can be missed in the volume of traffic received at a particular weather reporting station;

(f) aviation weather information suitable for flight planning is available via cable television in most US cities and in Toronto but not in other Canadian centres. It is not available over commercial radio stations in Canada. Some private pilots in Canada rely on newspaper published weather maps and commercial TV weather forecasts for flight judgments which nullifies the aim of providing aviation weather information to the client population and more importantly to the target population.

General Observations

2.27 These observations and the descriptive profiles contained in this and other Parts lead to the following general observations about aviation weather information services and the achievement of SAR prevention objectives:

(a) The target population of private and commercial licensed pilots in some areas is not well served by aviation weather services. Generally, federal government funded and operated weather services do not provide easy and timely access particularly at peak flying times. Also, these services generally do not provide the requisite level of forecasting accuracy required for low level visual enroute flights to unserviced airports.

Conclusions

2.38 The Team notes that it is CATA's responsibility to make the case for resources and specify the quality and level of service. Weather is a factor in nearly forty percent of air distress incidents so the importance of ready access to good quality forecasts cannot be overemphasized. The Team believes that, from the SAR point of view, improvements in these areas should be given high priority.

SECTION 3 - ASSOCIATED ACTIVITIES - MARINE

Marine Weather

3.1 Weather information required for maritime SAR operations differs significantly from that required for similar air operations. At present, maritime Search and Rescue requirements for meteorological information have been met by DND weather facilities at Trenton and Edmonton for the Great Lakes and Arctic areas. In any SAR operation, military and civilian weather facilities may be used as required.

3.2 Weather is an important factor in the prosecution of a search but it is also significant as either a cause of SAR incidents or a factor that could turn a marine non-distress situation into a distress incident.

3.3 At present, the backbone of the dissemination system for recreational boaters continues to be the commercial broadcast. In many cases, however, weather information is broadcast only at certain times and is, therefore, not always available through this means. The other dissemination method is via the Coast Guard VHF radio network. Although this weather information is continuously available, the relatively high cost of receivers makes the option unattractive to many boaters.

3.4 Supplementing these two systems are relatively new services such as dedicated cable television channels and Weather-Radio Canada, a continuous broadcast of weather information designed to fill local needs.

3.5 With the support of ICSAR, Atmospheric Environment Service is studying the dissemination of weather information to recreational boaters as well as the impact of meteorological support on SAR operations. These studies are expected to be completed by the end of 1981.

Marine Aids to Navigation

3.6 To ensure the safe movement of marine traffic, the Canadian Coast Guard is responsible for programs that provide the development and control of safe marine navigation. In particular, it directs the development of policies and standards for the planning, design, construction, operation and maintenance of aids to marine navigation. The CCG also co-ordinates the development of and recommends new or revised legislation and regulations for the routing and control of marine traffic.

3.7 These two basic control mechanisms establish a type of traffic system for marine navigation that provides a safer voyage. Information pamphlets are published on the use of the aids system and this information is covered in a general manner in the Canada Boating Handbook. Groundings and collisions account for approximately 7% of SAR incidents and could be reduced by proper use of these navigation aids systems.

3.8 CCG Vessel Traffic Management system managers are responsible for vessel routing across the country. In some cases, this routing is compulsory as required by Part XX of the Canada Shipping Act. In other cases, routing and reporting is voluntary but strongly encouraged through CCG Notices to Mariners (NOTMARS). This system of traffic management exists to prevent collisions and groundings and to ensure safe and expeditious movement of marine traffic. Nevertheless, smaller vessels under 20 metres in length or less than 500 tons and, in some instances any pleasure yacht, are not managed by these systems.

Observations

3.9 For the outputs and effects of this associated activity, it was observed that:

(a) the Atmospheric Environment (AES) weather forecasting and reporting services have deteriorated over the last few years;

(b) a large number of pleasure craft operators do not know where to obtain marine weather information;

(c) with very few exceptions, the mariner is well served by the currently installed aids to navigation;

(d) although the Vessel Traffic Management (VTM) system provides guidance and advice to commercial mariners in certain congested waters, the vast majority of vessel traffic is not under a surveillance system;

(e) in certain areas of Canada, communications are poor, for example: Douglas Channel, British Columbia and Newfoundland;

(f) some charts should be brought up-to-date;

(g) light stations are not all equipped with VHF/DF equipment;

(h) there is no single publication issued by CCG which consolidates a detailed description of the marine environment for small pleasure craft operators.

Conclusions

3.10 The Team was informed, on several occasions across Canada, that the accuracy of and access to local marine forecasts need improvement. At ICSAR's request, AES is currently studying means of improving dissemination of weather information to small boaters. An appropriate action plan is needed at this juncture.

PART VI - THE MANAGEMENT PROCESS

SECTION 1 - SAR PLANNING AND CONTROL

Introduction

1.1 The aim of Part VI of this report is to address the following evaluation issues:

(1) Are the responsibilities of the various departments involved in SAR consistent, compatible and adequate to achieve SAR objectives?

(2) Are ICSAR authorities, responsibilities and the accountability of the departmental ICSAR member clearly stated and do they facilitate the development of a comprehensive national SAR Plan, the monitoring of its implementation, and the reporting and evaluation of results in accordance with ICSAR's terms of reference?

(3) How could the quality of SAR planning and programming be improved so as to enhance the effectiveness of the SAR program?

(4) What are the information needs for a comprehensive management information system and future evaluation of SAR?

1.2 Accordingly, this evaluation of the management aspects of SAR emphasizes strategic and management planning, and control rather than operations planning and control issues. This is compatible with the Prime Minister's instructions that the operational aspects of SAR should remain the responsibility of the operating departments. This part of the report, therefore, describes the current organization, departmental responsibilities and program planning for SAR with its implementation. Additionally, it examines the requirements for monitoring program and policy implementation and evaluating the effectiveness with which the resources are utilized. This evaluation of the management process focused on longer term improvements so as to complement the changes required to make planning compatible with the expenditure management system.

Co-ordination of SAR Planning

ICSAR

1.3 The Interdepartmental Committee on Search and Rescue (ICSAR) was established in November 1976, pursuant to Cabinet's review of the recommendations of the Task Force for the Interdepartmental Review of Marine Search and Rescue. The initial concept was that this Committee should provide advice to Ministers in the areas of policy, planning, resources and effectiveness, as it applies to search and rescue. The committee was intended to ensure that government as opposed to departmental priorities were implemented. In addition, the Committee was to be responsible for the development of a national SAR plan for annual review by the Treasury Board, in which the need for dedicated SAR resources was identified, justified and matched against available capability. The Committee was to meet at least once every three months or as required to review SAR matters.

1.4 The Committee was to be chaired jointly by DND and DOT, and report to Cabinet through the Minister of Fisheries and the Environment in his capacity as Chairman of the Ad Hoc Committee of Ministers on Ocean Management Policies. The Committee was supported by a part-time secretariat staffed by three officers from DND, DOT and DOFE. Its members were from DOT, DND, RCMP, DINA and DEMR. Provision was also made for TBS to have observer status.

1.5 In December 1976, following a review by PCO of departmental responsibilities for SAR and subsequent consideration by the Prime Minister, the Minister of National Defence was appointed lead Minister and Spokesman for SAR. ICSAR, thereafter, reported through him to the Ad Hoc Committee of Ministers on Ocean Management. ICSAR's terms of reference were amended to show the revised reporting lines but no change was made in departmental mandates for SAR. General statements on the relative responsibilities of DOT and DND for Marine SAR were added to the ICSAR terms of reference.

1.6 The initial task of the Committee was to work towards implementation of the Task Force recommendations. At the same time, direction was given that priority should go to upgrading Marine SAR coverage in Newfoundland and British Columbia and that improved response should be achieved by upgrading existing equipment for Marine SAR, by multi-tasking existing equipment and by forming a Canadian Coast Guard rescue auxiliary. Further, minimizing the occurrence of incidents through improved prevention, regulation and enforcement should be another priority task.

1.7 Apart from the above, no direction was given on the scope of the issues to be addressed by the Committee nor on objectives for SAR. At its first meeting in November 1976, the Secretariat was asked to address priorities for implementation of the decisions flowing from the Task Force recommendations and departments were asked to develop policy recommendations to ICSAR concerning their particular SAR role. Members felt that the Committee should review proposals related to SAR such as surveillance satellites and airborne synthetic radar.

1.8 At the second meeting in June 1977, the DND Co-Chairman made it clear that the Committee had been set up to deal with SAR policy matters, not to run SAR operations.

ICSAR Secretariat

1.9 The current terms of reference for the Secretariat were adopted by the Committee at its ninth meeting in December 1978. They include the provision of technical and administrative support to ICSAR. Its main functions were: to co-ordinate and monitor the implementation of measures indicated by Cabinet as requiring immediate attention, the development of a National SAR Plan in conjunction with appropriate regional groups; to co-ordinate the preparation of answers to all enquiries related to SAR; to provide information to ministers as required; to co-ordinate all government press releases on SAR; to maintain an on-going review of federal SAR activities; and co-ordinate an annual report on the adequacy of the federal SAR response.

1.10 Until recently, ICSAR Secretariat members were provided by DND, DOT and DOF and had departmental duties as well. As of November 1, 1981 the Secretariat is to have two full time members on loan from DND and CCG. The Secretariat is also to have quarters on neutral ground. Space and administrative support were formerly provided by DND.

ICSAR Concerns

Policy Advice

1.11 ICSAR has addressed a number of policy issues, including the required level of SAR capability in the long and short term; (the requirement for a SAR Plan is discussed in the section on resources). The 1976 decisions which established ICSAR also provided a framework for the further development of Marine SAR operations, prevention, command and control. Marine SAR response was to be improved by upgrading existing equipment for Marine SAR, multi-tasking existing equipment available and capable of Marine SAR, and formation of a Canadian Coast Guard rescue auxiliary. At its first meeting in November 1976, it was noted that departments were expected to make policy recommendations concerning their particular SAR role.

1.12 At its second meeting, the Committee reviewed and approved the DND TB submission for SARCUP.

1.13 At its third meeting, ICSAR considered a DOT paper on Boating Safety Education for which a TB submission had already gone forward. The Secretariat was asked to prepare a cabinet memorandum on short and long term limits of SAR capability. The Committee was also briefed by DOC on SARSAT and was kept informed of SARSAT developments in subsequent meetings. At this meeting, in view of its co-ordination role for policy matters, ICSAR also directed the Secretariat to convene meetings to develop an approach to ensure that SARSAT/ELT programs reached their full potential to increase SAR effectiveness.

Effectiveness

1.14 ICSAR was reminded by Treasury Board in September 1977 that the planning process for SAR might be further enhanced by improved definition of SAR needs and standards of effectiveness, improvement of the SAR information systems, and the direction from ministers that work on effectiveness be undertaken by a TBS-led working group in consultation with PCO and ICSAR.

This work commenced by defining departmental objectives which were tabled at the 10th meeting of ICSAR in February 1979. Suggestions for effectiveness measures were tabled at the 11th meeting in June 1979. These were to be discussed between TBS and departments in July; no further reports on the matter were considered by ICSAR. At its 15th meeting in October 1980, the attention of members was drawn to a ministerial decision for a review of the SAR management process, to include making it fully compatible with the procedures for planning and resource allocation applicable to other government programs and any other areas judged useful for improving the responsiveness of the interdepartmental management system both in matters to be resolved by officials and those to meet the information and decision-making needs of ministers. An assessment of the effectiveness of SAR activities in the form of a program evaluation was also to be arranged.

1.15 The minutes noted that the TBS study had identified departmental and interdepartmental SAR objectives which have been accepted informally, except in the case of DOT(A), and that the study should be reconstituted to develop a system of assessing SAR effectiveness, including completing and confirming SAR objectives already drafted.

Planning and Resources

1.16 ICSAR has also been charged with giving advice on planning and resources. There follows a detailed description and analysis of the 1982/83 SAR Plan and a description of the planning process from both departmental and ICSAR secretariat viewpoints. A brief review of the 1977/78 to 1981/82 SAR plans indicates that there has been continuing concern for synchronizing the plans with the government's planning and budgetting cycle. This concern was most recently addressed in a PCO review of the program management in the context of expenditure management.

SECTION 2 - THE NATIONAL SAR PLAN

Introduction

2.1 The 1982/83 SAR plan consists of four parts with each part presented as a single document. These are: Part I, Executive Summary; Part II, The Analysis; Part III, Strategic Overview; and Part IV, Listing of Federal Government Search and Rescue Resources. The accompanying documents include a report that summarizes the progress achieved to date in implementing Cabinet decisions on SAR over the past several years. This progress report, or an improved version thereof, will in future years be a prime component of every SAR plan.

2.2 Part II, The Analysis, is the central element of the plan. It consists of nine chapters, the first four of which are regional chapters, one for each Search and Rescue Region (SRR). Each regional chapter contains a general description of the geography of the SRR with particular emphasis on those characteristics which pose a threat to marine safety. Present and anticipated levels of marine activities are also highlighted. This is followed by a series of data sheets which summarize the SAR situation in each area as to need and existing coverage and make recommendations to alleviate any resultant deficiencies in coverage. For each area, information is provided on the level of marine incidents over a five year period, the marine craft populations (commercial vessel, fishing vessel and pleasure craft) both present and anticipated, and any significant weather and tidal situations. The need for SAR coverage is further assessed against the risk to marine navigation resulting from five of the more important hazard factors.

2.3 The subsequent chapters are more global in scope. Chapter 5, Safety and Prevention, describes the organization and structure of the various elements of the prevention program. Efforts in the areas of education, regulation and enforcement are described, their achievements discussed and future directions proposed. Chapter 6, National Programs, contains proposals that have national implications while Chapter 7 is an executive summary of the DND SAR aircraft posture studies and addresses the location, numbers and standby posture of primary air resources across Canada. These studies were commissioned in response to a Cabinet direction to review response postures relative to actual need. Chapter 8 is a five-year capital acquisition strategy for the SAR component of the Canadian Coast Guard and Chapter 9, a summary of the resources required to implement the plan.

2.4 The plan addresses policy and resources affecting both the current and planned SAR program. It proposes a program requiring $42.4 M of capital funds, $103.0 M for PO&M, and 1,742 PY in 1982/83. The requirements identified exceed programmed resources by $18.9 M Capital, $5.4 M PO&M, and 167 PY. Of this amount, $9.9 M Capital, $4.3 M PO&M, and 132 PY are required to maintain the current level of operations and prevention activities. The remaining resources - $9.0 M Capital, $1.1 M PO&M, and 35 PY - are requested to improve the level of service beyond that which is currently provided. The DND component of this latter amount ($1.1 M Capital, $0.5 M PO&M and 16 PY) will be funded by the Department.

2.5 Most of the additional resources requested are for the marine component of the SAR program. The Canadian Coast Guard (CCG) requirements are for $15.6 M Capital, $2.2 M PO&M, and 64 PY. An additional $2.7M PO&M and 87 PY are for multi-tasking, $2.2 M and 71 PY of which is for the Department of Fisheries and Oceans (DFO) and the remainder for the Department of Transport. As part of its five-year capital acquisition strategy, the CCG is requesting approval to acquire five additional and ten replacement small craft for a five-year capital cost of $45.7 M.

Discussion

2.6 From its inception, the national SAR plan has served largely as a vehicle for advising ministers of the requirements for marine resources. Air resource requirements have generally been brought forward for consideration through other mechanisms. Although material on the SAR air component has always been included in these plans, the discussions have invariably been perfunctory and centered on existing SAR posture with little information provided on the current utilization of and the anticipated demand for SAR air services. Considering that over the period 1976 to 1980, rescue was effected by DND in almost 18% of the marine distress incidents on the two coasts and that approximately 40% of DND flying hours on distress cases in these regions was devoted to marine SAR, it is evident that both major components of the SAR program should be addressed at the same time.

2.7 As the exploration and exploitation of off-shore resources intensifies, fishing vessels will venture further offshore in response to the opportunities presented by the extension of the Canadian economic zone to a 200 mile limit. Should the anticipated growth in commercial vessel traffic materialize, the participation of air resources in marine SAR is quite likely to increase. In the past, this interaction has not received sufficient attention within the national SAR plan. There are indications, however, that ICSAR is moving towards a more integrated form of planning which should, in time, correct this situation. The 1982/83 plan, for example, provides more planning information for air SAR than any of its predecessors. Moreover, the adjustments to the recommended procedures for regional input should result in a national SAR plan that gives due consideration to air SAR as an alternative to changes in marine posture or increases in marine coverage.

2.8 The most contentious item in the 1982/83 SAR plan is the Coast Guard's five-year capital acquisition strategy. This plan proposes expenditures on major capital items and their supporting resources for the period under review. It includes the costs for transfer of existing vessels, for replacement of vessels whose SAR capability has been diminished as a result of age or other factors and for the expansion of the Coast Guard SAR fleet. Although this concept of a five-year capital acquisition strategy was first introduced in the 1979/80 SAR plan and the strategic plan has been updated annually since then, no substantive evidence has been presented in either the SAR plans or their accompanying Cabinet memos to justify the need for the resources requested.

2.9 The marine SAR Plan is based on the proposition that as activity in the marine environment grows, SAR incidents increase and the requirement for SAR responses grows accordingly. Since the number of SAR incidents has increased significantly in recent years and it is anticipated that the present upward trend in the number and utilization of marine vessels is likely to continue, SAR planners assert that there is an urgent need to enhance the Coast Guard's SAR capability. This position is further supported by the expansion in the number of pleasure craft, the frequency with which these vessels are involved in SAR incidents, and the actual and anticipated increases in vessel traffic in areas where the environment presents a severe threat to marine transportation.

2.10 The legitimacy of using growth in the number of SAR incidents, hazard factors and the population of marine craft to justify a request for new CCG vessels has frequently been questioned. Objections to this approach are based on both philosophical and operational considerations. The primary purpose of a SAR program, it is affirmed, is to offer assistance to those whose lives are in danger. Hence, the number of SAR incidents is not a true indicator of the demands for SAR resources since the major component, and the one which in the last five-years has grown most rapidly, is non-distress occurrences. Moreover, according to Sections 445, 446, and 516 of the Canadian Shipping Act and a Cabinet Directive, responsibility for providing assistance to vessels in distress is shared between the federal government and the captains of non-federal vessels plying Canadian waters. Furthermore, on the federal side, sole responsibility does not reside with the CCG.

2.11 Proponents of this thesis point out that of the 1,714 marine distress incidents that occurred between 1976 and 1980, rescue was effected by the CCG in only 449 cases (26%) whereas civilians were responsible for 592 rescues (34%). Of the 15,301 marine hours spent on marine distress incidents, the CCG provided 46% while civilians accounted for 27%. They further argue that SAR planners have offered no persuasive arguments to support their contention that overall Canadian SAR coverage is inadequate or that the projected demand for federal SAR resources is likely to materialize. Of the 6,057 lives at risk during the period 1976 to 1980, 4,507 were saved for a survivability rate (percentage ratio of the number of persons rescued to the number of persons on board) of 74%. This rate is not very different from that of the U.S. Coast Guard and, given the special circumstances surrounding some of the major fatal incidents, it is not likely that an enhanced SAR coverage would have significantly affected the probability of survival.

2.12 It is also their opinion that the evaluation of threats to marine navigation is not significant evidence of the risks encountered by the SAR client population since it has not been established that the major hazards are also the major causes of SAR incidents. In summary, then, resistance to the CCG capital acquisition strategy is based on the conviction that the SAR plan has not convincingly demonstrated that the actual or anticipated demand for SAR services exceeds the capability of the existing system. It is also suggested that in the determination of shortfalls, that is situations where SAR coverage is inadequate, SAR planners are biased in favour of providing dedicated resources and consequently do not take sufficient account of the coverage provided by vessels of opportunity. This bias, it is said, is also reflected in those sections of the plan which recommend increased federal SAR resources with little indication that adequate consideration has been given to the costs and benefits of the various alternatives.

2.13 In defence, SAR planners claim that, given the vagaries of the Canadian marine environment, a non-distress situation could rapidly deteriorate into a distress case requiring urgent attention. Hence, non-distress incidents should, in general, be accorded a prompt response and the assistance provided in these cases should be considered a form of preventive SAR. They also believe that the federal government has sole responsibility for providing assistance to all marine vessels within Canadian waters and that while all government vessels are obligated to respond to a call for assistance, the government has designated the CCG as the primary instrument for delivery of an effective and efficient marine SAR service. They also argue that the federal responsibility in SAR goes beyond the saving of lives. It includes the provision of assistance to those in need and the relief of distress and suffering.

Observations on SAR Planning

2.14 A review of SAR operational data for the period 1976 to 1980 indicates that:

- although nationally both non-distress and distress incidents increased yearly throughout the period, non-distress cases (M3 incidents) increased at a faster rate. Hence, the severity rate declined and by 1980 only one of every fifteen incidents was a distress. In comparison, one out of every five responses of the USCG is to a distress situation.

- the growth in distress incidents was greatest in the Victoria SRR whereas for non-distresses the greatest increase was in the Trenton SRR.

- While dedicated vessels contribute 63% of the vessel-hours spent on non-distress SAR, they account for only 34% of the distress SAR hours.

- Of the 48,570 vessel-hours the CCG devoted to marine SAR, approximately 86% was for response to non-distress incidents. This percentage varied across the nation from a high of 88% in the Halifax SRR to a low of 79% in the Trenton SRR.

- Over the years, the CCG has been spending a larger fraction of its sailing hours on non-distress SAR. This trend is strongest in the Trenton SRR where the effort on non-distresses has increased from 70% of the total in 1976 to 84% in 1980.

- Fundamental SAR characteristics such as the type of vessels most likely to be involved, the nature and cause of the incident, the area, distance from shore and hour of the day, vary considerably between distress and non-distress incidents.

2.15 It is evident from the above that the characteristics of distress incidents are quite different from those of non-distresses and that, in recent years, an increasing percentage of the resource effort of the CCG has been utilized in assisting those in non-distress situations. These differences in characteristics impose different requirements on the forces offering assistance and, therefore, a plan designed for non-distress occurrences will almost certainly not be appropriate for distress incidents. Similarly, a plan whose primary concern is distress cases would be unnecessarily expensive if most of the resources are to be used for non-distress SAR. There is, unfortunately, no evidence in either the SAR plans, the planning documents from which they are derived, or the planning procedures, to suggest that SAR planners pay appropriate attention to these considerations.

Conclusions on SAR Planning

2.16 Effective planning cannot co-exist with an environment in which there are no generally agreed objectives. At present, marine SAR planning appears to be based on the assumption that coverage should be adequate to respond to both distress and non-distress incidents. There is, however, no agreement on how to assess what is adequate. Moreover, there are many, both inside and outside the SAR system, who do not subscribe to the liberalized interpretation of SAR. Since the requirements as to type, quantity, deployment and readiness of SAR marine resources are significantly different for distress and non-distress incidents, there is an urgent need for reconciliation of these divergent views. Accordingly, the Team concludes that:

(1) The term SAR should be defined.

(2) The federal role in SAR should be defined.

(3) The role of the CCG, in planning for and provision of SAR resources, should be articulated.

2.17 Effective planning also requires the provision of credible evidence that the problems have been correctly diagnosed, that all viable options have been identified and subjected to rigorous analysis and that both cost-effectiveness and political considerations have received due attention in the decision process leading to the recommended solutions. Current SAR plans and their supporting documentation do not provide these assurances. There is no detailed analysis of need. Consideration of SAR coverage is limited to primary and secondary air and marine resources.

There is no information on the costs and effectiveness of the options which have been rejected. For improved planning and to provide a better basis for ministerial decisions, the Team concludes that:

(1) Ministers should be presented with options and associated costs in SAR Plans.

(2) SAR Plans should provide information which would enable ministers to decide whether it would be preferable to provide coverage through greater emphasis on federal resources or by other alternatives -- such as volunteers, provincial, municipal and contract resources and, where appropriate, through co-operation with U.S.A. authorities.

2.18 In the analysis of need, all incidents are treated equally with no distinctions between genuine distresses, communication searches, or temporary distresses which require at most monitoring action. Data at this level of generality may provide an accurate record of the workload of the RCCs but it lacks the discrimination needed for an accurate assessment of the SAR problem. It has been suggested that this situation arises because of deficiencies in the reporting system. Our review, however, has indicated that, while there is a great need for improvement, the current systems nevertheless capture a considerable amount of useful information which is not used by SAR planners. It appears more likely that the major contributing factor has been the haste with which past plans have been developed. There has also been less than rigorous analysis of the marine response problem, and the best use is not being made of available information.

2.19 Assessment of the need for marine SAR resources has, to date, depended on what can be fairly described as subjective approaches. Future progress will, to a large measure, depend on the implementation of systems and procedures which allow a more objective analysis. Towards this end, special studies should be commissioned to provide the information essential to effective planning. The nature and causes of distress and non-distress incidents should, for example, be separately determined and the trends, if any, identified and monitored. Similarly, the type of assistance required and the resources providing this assistance should be reviewed. In the conduct of these studies, information additional to that contained in SARSTATS should also be utilized. SAR special reports and UNSAR data should be analyzed, as well as the reports and internal documents of groups involved in such activities as casualty investigations, ship inspection and other enforcement actions.

2.20 Another major deficiency in SAR planning is that, in general, the major requirements for air resources are not assessed within the framework of the SAR plan. As a result, the requirements for air and marine resources are not jointly reviewed and trade-offs made to arrive at the most cost-effective mix of resources compatible with the overall needs of the SAR program. Some movement in this direction is evident in the revised procedures for the 1983/84 plan where, for the first time, regional planners will use a common methodology to assess simultaneously the needs for air and marine resources. However, constraints imposed by contradictions in the procedures for preparing regional inputs mitigate against a successful resolution of the problems inherent in producing a truly integrated SAR plan. Regional planners are, for example, exhorted to co-ordinate their efforts so that "the most cost-effective methods (be it marine, air, a mix of the two, or others) for alleviating shortfalls" can be determined. It is difficult to see how this can be successfully accomplished since it is only at a much later date that NDHQ will aggregate and cost the DND requirements. Since 1976 DND has responded to ministerial requests for changes in force postures by altering the disposition rather than the number of aircraft provided. These considerations, together with discussion in Part II of the Main Report of opportunities for improvement in aircraft capabilities and coverage lead the Team to conclude that:

(1) Greater attention should be paid to analysis of the marine SAR response problem.

(2) Improved planning procedures and approaches are required to ensure that proposals for additional SAR vessels are effectively traded off against proposals for coverage by fixed and rotary wing aircraft of improved performance.

2.21 ICSAR has been in existence for a little more than four years. During this relatively short period, it has prepared six national SAR plans. In its broadest context, SAR planning has evolved from what initially was a rather primitive exercise to a stage which now has elements of considerable sophistication. The planning process has undergone a number of major revisions which have resulted in significant improvements in the SAR plan. Additional changes have been introduced for the 1983/84 plan and it is anticipated that this plan will be a further improvement on its predecessors. Nevertheless, there is still a need for further enhancement. The achievement of the intended objectives of the national plan will in large measure depend on the urgency with which the issues discussed above are resolved.

2.22 A separation of SAR planning information in two parts, a long term plan, put forward and updated at the same time as strategic overviews could be the basis for the annual estimates submission. Such a long term plan, when approved, would be most useful if it provided guidance on the scope of the SAR program and its structure, assigned departmental responsibilities for activities and tasks to carry it through, and presented alternatives of resources mix for consideration, including plans for air response.

Conclusions

2.23 Ministers should have an opportunity to consider air and marine requirements jointly and the possible trade-offs between them. Because of the long lead times for DND capital items there is a need to extend the time horizon of SAR planning. This, and the need to reflect strategic overviews concretely, suggests there should be a SAR Program Long Term Plan to provide a framework for the annual federal plan.

SECTION 3 - THE SAR PLANNING PROCESS

SAR Planning in ICSAR

3.1 A Cabinet Decision established a Task Force chaired by the Treasury Board Secretariat and drawing on the expertise of officials from the departments of National Defence (DND), Transport (TC), and Fisheries and the Environment (DFE), to recommend ways of ensuring the effective use and allocation of resources for marine Search and Rescue (SAR). This initiative was, in part, the result of a concern for the timely development of an improved SAR capability and a desire to ensure that government vessels were used in the most cost-effective manner through multi-tasking, improved co-ordination of operations, and greater appreciation by operating departments of government priorities as opposed to purely departmental priorities. The Task Force presented its report, titled the Interdepartmental Review of Marine Search and Rescue, to Cabinet on 4 November 1976.

3.2 The resulting Cabinet Decision established the Interdepartmental Committee on Search and Rescue (ICSAR) consisting of representatives from the departments of National Defence, Transport, Fisheries and Environment, Energy, Mines and Resources, Indian and Northern Affairs, and the Royal Canadian Mounted Police. ICSAR was assigned the responsibility for advising ministers on policy, planning, resources and effectiveness in matters pertaining to search and rescue, and was to commence immediately to work towards the implementation of the recommendations of the Task Force. The committee was also directed to develop a national SAR plan for annual review by the Treasury Board in which the need for dedicated SAR response was identified, justified and matched against available capability.

3.3 ICSAR created a Secretariat, staffed by representatives from DND, TC and DFE, and assigned it the task of developing the national SAR plan in consultation with regional representatives from each of the three departments primarily involved in search and rescue. A draft of the first annual SAR plan was presented to ICSAR for review at its meeting of 24 June 1977 and was approved subject to revisions in the cost schedule. The revised National Search and Rescue Plan 1977/78 was approved for immediate implementation by the Ad Hoc Committee on Ocean Management on 7 September 1977 and was considered by Cabinet at meetings in September and October 1977.

3.4 The 1977/78 National SAR plan consisted of two parts, one dealing with the air resources required for SAR and the other with marine resources. Within the plan, a comparison was made between the need for SAR resources, based on the level of SAR incidents during 1976, and the existing SAR coverage. Shortfalls were thus identified and measures were recommended to alleviate these shortfalls. The Air and Marine sections of the plan also identified and categorized all primary and secondary SAR resources and indicated their location for each region. In addition to the plan, ICSAR submitted a document which reported on the action taken to date on the implementation of the recommendations of the Task Force for Marine SAR and the directions contained in previous Cabinet decisions.

3.5 Cabinet, in approving the first national SAR plan, noted that future resource requests should be accompanied by a clear analysis of need and of cost-effective alternatives. Towards these ends, recommendations were made subsequently that SAR planning should be enhanced through the capture and manipulation of data which more adequately describe the nature and causes of the incidents and the efforts involved in the responses. Concurrently, improvements were to be sought through the development of a system for measuring the effectiveness of SAR activities.

3.6 In addition to entrusting ICSAR with the responsibility of producing an integrated and cost-effective national SAR plan, Cabinet has, through a series of past decisions, clearly articulated the outlines of a planning framework within which it expects the committee to operate. Cabinet has, for example, frequently stated its commitment to multi-tasking and to a greater utilization of voluntary organizations in the delivery of SAR services. Similarly, priority has often been accorded to the prevention of SAR incidents through education, regulation and enforcement rather than unbridled expansion of the operational component of the program. ICSAR's attention has, on numerous occasions, been directed to the hazard created by inexperienced or incompetent operators of pleasure craft and the need to formulate proposals that would enhance the safe operation of such vessels. More specifically, the Committee has repeatedly been tasked to investigate and make recommendations on the effectiveness of measures such as cost recovery, licensing fees and greater enforcement of marine safety-related regulations.

3.7 Since its first efforts in 1977, ICSAR and its Secretariat have prepared five plans and are currently engaged in the preparation of a sixth. Over this period there have been substantial changes in both format and content which have led to significant improvements in the quality of the planning documents. While some of these changes were undertaken on ICSAR's own initiative, many resulted from Cabinet directives specifically addressed to SAR matters while others are the products of government-wide changes in the Policy and Expenditure Management System. Consequently, the national SAR planning process has had to be adjusted to meet these changing circumstances.

3.8 Since this process is still evolving, the decision was taken to review the steps involved in putting together the 1982/83 version of the plan while taking due note of any anomalies that might have occurred as a result of the haste with which it was produced and of any important changes that have occurred since then. The 1982/83 Plan was then assessed on the basis of its ability to meet the decision making needs of ministers and an attempt made to relate its strengths and weaknesses to the planning process and the procedures associated with it.

3.9 The 1982/83 SAR Plan was developed under conditions which, even for ICSAR, were quite unusual. It was the third plan to be prepared during the 1980/81 fiscal year and, as a result, it was considered unnecessary to institute many of the procedures that had been advocated under more normal circumstances. This section, therefore, describes the best features of the procedures recommended for years prior to 1982/83. Thus, what follows is a generalized version of the SAR planning process. This version is, in most respects, not substantially different from that of the 1983/84 planning cycle.

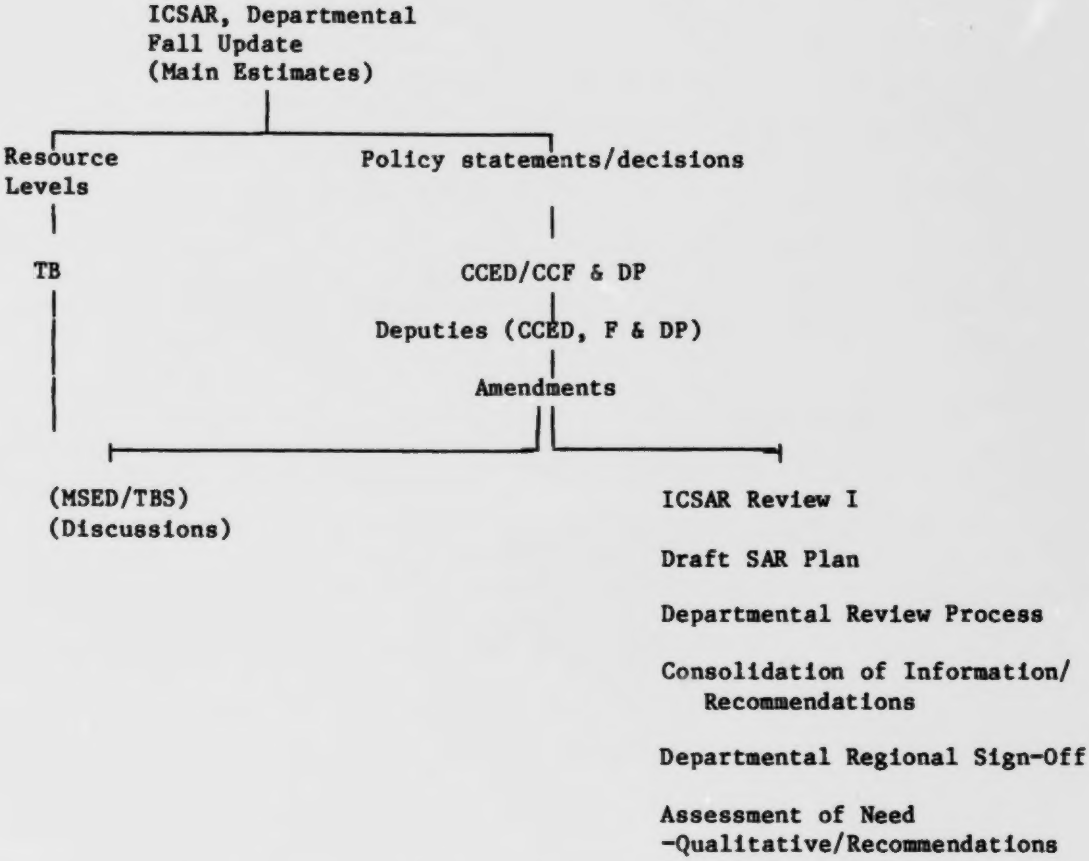
3.10 According to statements made during interviews, the documentation provided by the ICSAR Secretariat and that acquired from other sources, representatives of the four SAR regions, at an early stage of the planning cycle, are reminded of the required procedures through detailed instructions for the completion of the regional input to the national SAR plan. They are also advised of any deficiencies in the most recently submitted planning documents and provided with suggestions for improvement.

3.11 Regional representatives of DND, CCG and DFO are instructed to develop a consolidated regional submission for their SAR region. Towards this end, it is suggested that the DND/RCC should chair a meeting to identify shortfalls, if any, in the existing coverage and to propose alternative measures for overcoming such deficiencies. Prior to this meeting, the DND and CCG representatives should prepare analyses of the needs and shortfalls of SAR services while all three departments should participate in the identification of expected coverage and of the options for providing the desired levels of services. The departments are then to cost the proposed options in their respective areas of operational responsibility and at subsequent meetings resolve any differences arising from the prior meeting, assess the options and decide on recommendations. While the intent of these instructions is laudable, the evidence strongly suggests that they have not been implemented by the regions.

3.12 Information copies of the regional submissions are forwarded to the ICSAR Secretariat. On the air side, action copies are transmitted to the Commander AIRCOM for comments and submission to NDHQ while on the marine side, inputs are channeled through the CCG Regional Directors to the Director, Fleet Systems, CCG Headquarters. At Headquarters, the regional submissions are consolidated and the recommendations reviewed for concordance with departmental policies and priorities. The decisions of the Headquarters groups are communicated to the departmental ICSAR Secretariat member who, together with his colleagues, consolidate these into a draft of the National SAR Plan. After review and concurrence by ICSAR, the plan is submitted for approval to all departments actively involved in delivery of the SAR program. Major differences, if any, are reconciled and the approved plan is returned to ICSAR for its endorsement and subsequent recommendation to the Minister of National Defence, who submits it to Cabinet. Figure 3-1 is a flow chart of the planning process.

FIGURE 3-1

SAR PLANNING/REVIEW PROCESS


ICSAR, Departmental
Fall Update
(Main Estimates)
Resource
Levels
Policy statements/decisions
TB
CCED/CCF & DP
Deputies (CCED, F & DP)
Amendments
(MSED/TBS)
(Discussions)
ICSAR Review I
Draft SAR Plan
Departmental Review Process
Consolidation of Information/
Recommendations
Departmental Regional Sign-Off
Assessment of Need
-Qualitative/Recommendations

3.13 It is evident that the Secretariat has designed a planning process which has a number of commendable features. It is however, also evident that while the steps for the preparation of an annual SAR plan are clearly outlined in the instructions, in the past, departments have not adhered to these procedures. So far, the annual plan has been basically a marine SAR plan with air requirements addressed only as they relate to marine SAR. Moreover, factors such as the long lead time for procuring major capital airborne equipment, the severe competition for funding within the DSP budget and the fact that SAR is not specifically considered as an operational program within DND long-term plans, lessen the chances of a prompt positive response to the air resources implications of the marine SAR plan. This situation illustrates one of the basic deficiencies in the planning system, namely that by default, policies and priorities for SAR are established by considerations unrelated to the efficiency or effectiveness of the SAR program.

SAR Planning in DND

Departmental Objectives

3.14 DND's statement of fifteen departmental objectives and fifty-five tasks includes SAR as a specific task of objective five. The departmental measuring system attempts to record performance against the SAR Task and sub-tasks. So far, performance measures are limited to statements of squadron stand-by times.

SAR Objectives

3.15 An interdepartmental working group convened by the Treasury Board Secretariat to develop proposals for measuring the effectiveness of the Annual Search and Rescue Plan proposed departmental objectives for SAR in February 1979. The proposed DND objectives are as follows:

SAR Operations

(1) To co-ordinate, control and conduct SAR operations for aircraft in distress in the Canadian assigned area of responsibility.

(2) To co-ordinate and, in collaboration with the Canadian Coast Guard, control and conduct SAR operations for ships in distress within the Canadian assigned area of responsibility.

(3) To conduct mercy flights and other humanitarian tasks.

(4) To conduct ground searches.

(5) To maintain an appropriate SAR response capability.

SAR Prevention

(1) To maintain operational liaison with DOT/AIR, DOT/CCG and other appropriate authoritities, through such procedures as searchmaster reports to promote the highest level of safety in the civil aeronautic and marine environments.

(2) To support DOT/AIR and DOT/CCG in SAR prevention through participation in education programs.

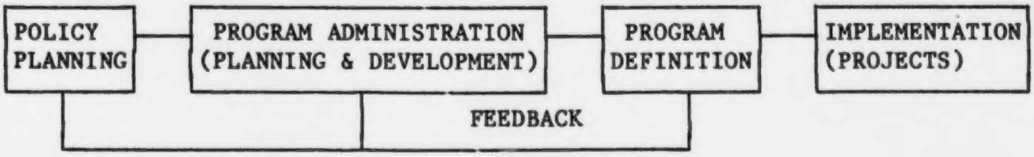
Txhese proposed DND objectives have not yet been approvd by ICSAR, by senior departmental management nor by ministers. In May 1981, objectives and tasks proposed in the SARCORE report were approved by the DND Program Control Board, and the Defence Management Committee as an information item in July 1981.

Planning Process

The Defence Program Management System

3.16 Within DND, resources to fulfill objectives and accomplish departmental activities are approved through the defence program management system which has four phases :

FIGURE 3-2

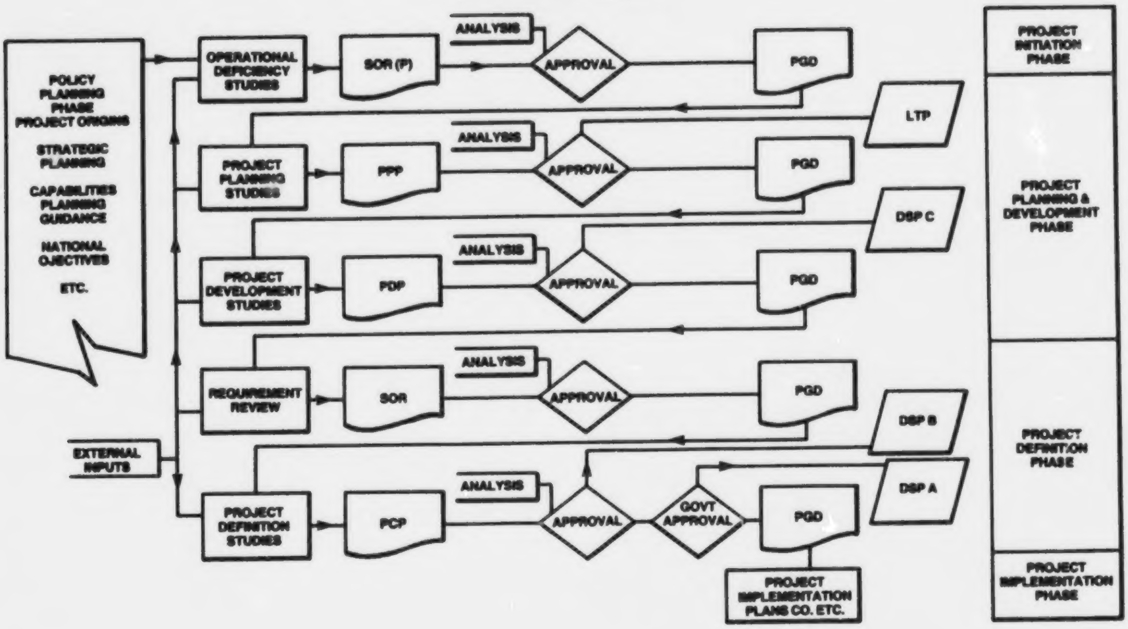

POLICY PLANNING
PROGRAM ADMINISTRATION (PLANNING & DEVELOPMENT)
PROGRAM DEFINITION
IMPLEMENTATION (PROJECTS)
FEEDBACK

3.17 Longterm planning and policy are developed in a Capabilities Planning Guidance Document which leads to projects in the Long-Term Program (LTP) or the Defence Services Program (DSP). Proposals to change the LTP are activated through these documents. A proposed change in policy is initiated as a plan in a Statement of Requirement (Preliminary) SOR(P). Following approval, a Program Planning Proposal (PPP) is developed to identify resources, funding and R&D requirements. Approval of a PPP provides for entry into the LTP and justifies commitment of staff resources to project development studies.

3.18 A change in the Defence Services Program is initiated as a program by a Program Development Proposal (PDP) which provides departmental approval-in-principle to allocate resources and conduct program definition studies. A Statement of Requirement then describes the specific defence requirement for which it is planned to commit DSP resources. This is followed by a Program Change Proposal (PCP) which provides departmental approval to commit specific DND resources for a specific purpose over a specific time. The PCP results in project implementation plans, milestones, contract documents and other items necessary to support the introduction of new capital such as equipment, construction and R&D. Figure 3-3 shows the relationship of proposals to the DSP and LTP.

FIGURE 3-3

THE DEFENCE PROGRAM
MANAGEMENT SYSTEM


POLICY PLANNING PHASE PROJECT ORIGINS
STRATEGIC PLANNING
CAPABILITIES PLANNING GUIDANCE
NATIONAL OBJECTIVES
ETC.
EXTERNAL INPUTS
OPERATIONAL DEFICIENCY STUDIES
SOR (P)
ANALYSIS
APPROVAL
PGD
LTP
PROJECT PLANNING STUDIES
PPP
ANALYSIS
APPROVAL
PGD
DSP C
PROJECT DEVELOPMENT STUDIES
PDP
ANALYSIS
APPROVAL
PGD
REQUIREMENT REVIEW
SOR
ANALYSIS
APPROVAL
PGD
DSP B
PROJECT DEFINITION STUDIES
PCP
ANALYSIS
APPROVAL
GOVT APPROVAL
PGD
DSP A
PROJECT IMPLEMENTATION PLANS CO. ETC.
PROJECT INITIATION PHASE
PROJECT PLANNING & DEVELOPMENT PHASE
PROJECT DEFINITION PHASE
PROJECT IMPLEMENTATION PHASE

The above planning and programming procedures deal primarily with capital projects. Separate procedures are available for small items through standing authorities, change notes, special reports called Material Authorization Change Request (MACR) or Communication Requirements Requests (CRR's) which authorize changes to issues for the equipping and sustaining of field forces.

3.19 The major expenditure is for personnel, operating and maintenance. Increments in person-years and establishments require Treasury Board and Cabinet approval. Recurring expenditures arising from operations and maintenance of major equipment and systems are controlled through the Logistics Guidance Document (LOGUIDE) which authorizes rates which can only be changed by a PCP. In the case of aircraft operations, the LOGUIDE approved rate authorizes yearly flying rates and all POM costs and activities are then related accordingly.

3.20 Resource and development projects can be approved by PDP's or PCP's against capital resources, or may be contained within other project developments. The Defence Services Program Information Systems (DSPIS) provide computer-generated reports and displays on costs, resources and milestones. Within DND, the ADM Policy manages the PPMS process through DSP, DSPIS, Policy Analysis and Defence Performance Measurement System directorates. The Vice-Chief of the Defence Staff (VCDS) is responsible for the Defence Services Program. The responsibility for defining operational requirements and relative priorities rests with the Deputy Chief of the

Defence Staff (DCDS). Authorities for capital projects are delegated according to cost thresholds. Major Crown projects in excess of $100 million are subject to TBS approval. Figure 3-4 shows approval thresholds.

Figure 3-4 - Approval Thresholds - Capital Expenditures

Decision Document	Level	Approval Authority
SOR(P)	All	Group Principals
PPP	All	DCDS
PDP	$500K-$5M $5M	PCBSC PCB
SOR	All	Group Principals
PCP	$500K-$5M $5M-$50M $50M	PCBSC PCB DMC

Defence Program Planning and SAR

3.22 The main estimates objective for the Defence Services Program is "to ensure the security of Canada and to contribute to the maintenance of world peace". There are eight sub-objectives, of which that providing for SAR is "to supplement and support the civilian authorities in maintaining surveillance and preserving control over the security within the national territory of Canada and areas of Canadian jurisdiction, to assist civilian authorities in the event of emergency or disaster, to provide search and rescue services and to contribute to national development".

3.23 SAR is contained within the "Military Support Forces" activity which provides for airlift, strategic communications, emergency communications, contributions to national development and "co-ordination of search and rescue plans provided to fulfill national and international obligations". SAR, as a proportion of estimates for Military Support Forces, is shown in Figure 3-6.

Figure 3-5 - SAR Resources as a Proportion of the Main Estaimtes "Military Support Forces" Activity 1980/81 ($ millions)

1980/81	Military Support Forces Estimates	DND SAR From National SAR Plan	Percent of SAR of Estimates
PO&M Estimate	$481	$52	
Capital Estimate	35	11	
TOTAL	$516	$63	12%
Person Years Military Civilian	 9,890 4,149	 821	 6%

3.24 Within DND SAR policies and projects follow the DND approval process described earlier. Planning for the execution of current operational policy is sustained in Air Command. Within Air Command, Air Transport Group originates a substantial number of proposals and therefore has a major staffing capability to support SAR. This staffing will move to AC HQ in 1981. Requirements related to SAR are consolidated and forwarded to headquarters to the Chief of Air Doctrine and Operations (CADO), whose Branch DAOT 5 is responsible for SAR matters. PCPs or policy decision documents concerning SAR are originated by and staffed through the system by DAOT 5.

3.25 SAR PCPs compete for resources first with other Air Force requirements and then with all land, sea and air requirements. Minor changes may be generated by air staffs at the group, Air Command and NDHQ level.

3.26 CADO's responsibility is to see that all air military requirements are met within a system of priorities and limited resources. His principal concerns are the provision of air and land tactical air forces, maritime air forces and the training, scientific, command and management structures to support those forces. Capital and POM resources are for defence activities.

3.27 Long term air development plans assume activity levels and capabilities for SAR similar to the amount the LTP provides for major replacements of SAR fixed-wing and rotary-wing aircraft in the mid-1990s. Fixed and rotary wing aircraft lives are assessed by a DCDS approved Estimated Life Expectancy formula for logistic guidance. Phase out dates for specific aircraft are established using a five year lead time to enable disposal implications to be determined. The LOGUIDE indicates existing life expiries in the mid-1980's. Thus relifing programs will shortly need to be defined.

3.28 The detail provided above concerning the DND planning system illustrates only key relationships between DND planning and SAR planning.

Planning Concerns

3.29 Since 1976, planning has focused on command and control issues related to the operations of RCCs and the modification of the CH113 helicopter through the SARCUP program to make it more effective in its SAR role. Both fixed wing and helicopter postures have been reviewed subsequent to the decision taken in 1976. Improvements were made in RCC communications facilities. A special study of the helicopter units in the Prince Rupert Area was also completed. During this period, DND also undertook responsibility for Canadian participation in the international SARSAT program. This was financed from existing resources.

3.30 A major DND concern has been that items put forward by the Department for consideration in the National SAR Plan have been approved, but without approval also for additional funds, with the result that they had to be accommodated within existing Defence Services Program Resources, at the expense of other DND priorities, both for the 1977/78 and 1978/79 plans. It appears that this inhibited DND from making proposals for the plan which could not be readily funded within existing resources until the 1982/83 Plan, when it was apparently decided that SAR program growth would be permitted in line with envelope growth.

3.31 Further concerns vigorously expressed to the Team at the SAR Squadron and RCC level were, first the time taken, which was more than ten years from the time the need was originally identified, to get VHF/FM equipment installed in SAR aircraft so they could communicate directly with vessels at sea and with police vehicles and second, the archaic state of communications, record keeping, data storage, and look-up and information handling capabilities generally in the RCCs.

3.32 Field personnel were clearly skeptical that ICSAR had any influence on the resources available to them or that it had been successful in reducing the delays they saw in approval of their request for new modified equipment.

3.33 Frustration was expressed to the team, both at the RCC and SAR squadron level, concerning the apparent lack of response by DOT in following up on apparent infractions of air and marine regulations perceived to be responsible for SAR incidents. Similar concerns were expressed to the team at the command and headquarters level. Both at the command and the headquarters level there was a widely held opinion that more should be done to reduce SAR incidents through regulation and enforcement and also especially through education and promotion.

3.34 At the squadron level, there was a strong commitment to the DND SAR role, including participation in humanitarian missions, because of its demanding nature, the challenge provided and the great sense of personal satisfaction it brings. At the command and headquarters level, there was general realization that the provision of SAR resources from the DND budget meant some defence needs went unfilled, and a feeling that this role was not consistent with DND's primary mission. Some commanders thought that, in the long term, the primary responsibility for SAR should rest with another department, probably DOT.

3.35 Command and control issues surfaced at headquarters, command and RCC levels. Relations between the CCG and DND personnel were clearly excellent in all areas except the Victoria SRR, where the heavy preponderance of marine incidents led to difficult relationships between DND and CCG personnel in the RCC and between DND commanders and CCG regional managers. (The SARCORE study addresses the RCC issues.) A recent DND decision that Air Command should be responsible for training and operational standards of performance within RCCs has dealt with one issue that the Evaluation Team would otherwise have considered. The concept of unified DND command and control of SAR operations is clearly seriously strained in the Victoria Region where marine incidents predominate. Indeed, as noted elsewhere in this evaluation report, solutions to the problems of marine SAR response in the Victoria area would probably provide a guide for the rest of the country, for it is here that RCC organization is most heavily loaded and the SAR response systems is most subject to criticism by the public and the press. The epicentre of these rumblings is marine activities in the areas of Victoria and eastern Juan de Fuca, the Gulf Islands, Sandheads, and Northern Gulf of Georgia (SAR Marine Areas 301, 302, 303 and 304).

Observations

3.36 (1) DND SAR objectives do not have explicit ministerial approval.

(2) SAR is not a specifically identified activity within the Defence Services Program.

(3) DND has been inhibited, by the manpower and funding constraints of the DSP, from making proposals for inclusion in the National SAR Plan for the years 1979/80 through 1981/82.

(4) The National SAR Plan has not attained ministers' objective of having government rather than departmental priorities govern the magnitude of SAR air resources.

(5) The concept of unified command and control of the RCCs is under serious strain in the Victoria region.

Conclusions

3.37 (1) The advantages and disadvantages of identifying SAR separately within the DSP or as a separate DND program should be assessed and also, the possibility of isolating it from DSP manpower and envelope constraints or financing the program from a funding envelope in which other "like services" are reviewed, and relative priorities assigned.

(2) Alternatives to DND command of CCG marine controllers should be considered

SAR Planning in DOT

Air Administration

Objectives

3.38 A TBS Working Group proposed objectives for the DOT Air Administration to ICSAR in 1979 as follows:

SAR Operations

i) To assure that for civil aircraft in distress in Canada or in its oceanic areas of responsibility, the means and methods are provided to achieve efficiency in alerting the responsible SAR agency, in locating the distress incident, and in succouring and rescuing the survivors.

ii) To provide the DND SAR organization with specialized departmental resources and expertise as a functional part of its organization.

SAR Prevention

i) In co-operation with DND and in consideration of recommendations from that department, to develop and implement SAR prevention programs designed to promote a high level of safety in Civil Aeronautics.

3.39 The Deputy Air Administrator has agreed to these objectives but they have not been approved by departmental senior management nor by ministers.

Planning Process

3.40 In April 1977, because of the problems arising out of ELT carriage policy, potential CATA involvement in the SARSAT project, the creation of ICSAR and the 1976 ministerial decisions concerning SAR, the Director General Civil Aeronautics authorized the formation of a "Special Project on SAR Activities". This project is among the responsibilities of the Director of the Aeronautical Policy, Planning, Programming and Development (DPD) Branch. The project included the study and resolution of legal, regulatory, functional and technical issues related to ELTs with consideration of present and future domestic and international SAR requirements, the planning and control of all search and rescue activities, and recommendations on future requirements. Two person-years and associated expenses were provided for this.

3.41 The manager of the project was authorized to plan and control all activities associated with ELTs, co-ordinate all CATA activities associated with SAR, and make recommendations on the future requirements for establishing a permanent unit responsible for SAR matters.

3.42 Under the direction of the Manager of the Special Project on SAR, an internal discussion paper concerning CATA's SAR responsibilities and involvement was commenced in April 1979 and completed in December 1979. Also completed in December 1979 was a study concerning the proposed organization of a CATA SAR unit. These reports were presented to CATA Branch Directors of the Directorate of Civil Aeronautics in January 1980 and subsequently forwarded for the consideration of the CATA Administrator in April 1981. To date, (October 19, 1981), no decision has been taken on the recommendations.

Planning Concerns

3.43 The first report of the Dubin Commission, along with its testimony and interviews with CATA staff shows that policy for the carriage of ELTs, which is expected to result in a reinstatement of ANO Series II no. 17, was resolved through a series of ad hoc studies and analyses that, despite the terms of reference, were not planned, controlled, or co-ordinated by the SAR Special Project Office.

3.44 A review of SAR Plans, ICSAR Minutes and ministerial decisions indicate that CATA took no initiatives subsequent to 1976 through the SAR planning process to acquire resources or to implement ministerial direction that special priority should be given to the prevention of SAR incidents.

3.45 It is also apparent that the CATA member of ICSAR, the Director of Aeronautical Policy, Planning and Programming or his representative, have not been able to speak for CATA without constant referral to higher authorities within the Air Administration in relation to ELT matters in particular.

3.46 An examination of a recent study concerning an Evaluation of Planning and Programming in the Department of Transport by the Evaluation Branch of the Department indicates that SAR prevention activities are not yet defined nor rolled up in any way for departmental or ICSAR review or consideration. This view has been confirmed by interviews with CATA headquarters staff. This being the case, no detailed description is provided of the CATA planning process and its related SAR planning since it has not taken place. If individual CATA directorates have taken initiatives which impinge on SAR, they have not been visible to ICSAR nor to ministers, nor formed part of the National SAR Plan except for discussions related to ELT carriage.

Observations

3.47 1) CATA has developed and implemented neither strategic nor program objectives for its SAR operations or prevention activities. This may not be surprising since CATA does not appear to have accepted that it has SAR objectives.

2) No integrated long-term planning or program planning in relation to SAR operations or prevention is underway.

3) Proposals to develop a permanent focus for the co-ordination of all CATA activities associated with SAR have not been acted upon by senior management.

4) There has been no response by way of proposals to ICSAR to ministerial direction that priority should be given to the prevention of SAR incidents.

5) The CATA member of ICSAR does not appear to have either the authority or the responsibility to speak for CATA on SAR matters.

Conclusions

3.48 1) There has been a minimal and unco-ordinated CATA response to ministerial direction regarding SAR.

2) The level of CATA representation on ICSAR is below that required to speak authoritatively for the department, or to ensure that commitments made to ICSAR, or requests from ICSAR, are dealt with expeditiously within CATA.

Marine Administration

Objectives

3.49 A TBS working group proposed objectives for the DOT Marine Administration to ICSAR in 1979 as follows:

SAR Operations

i) In co-operation with and subject to co-ordination by DND, to control and conduct SAR operations for ships in distress within the Canadian assigned area of responsibility.

ii) To maintain a sufficient level of SAR response capability, to ensure a reasonable probability of locating and rescuing persons in marine situations where lives are at risk, or where deteriorating circumstances are such that if prompt action is not taken, risk of life is imminent.

iii) In responding to marine distress situations, reasonable efforts may be made to minimize loss of property, pending the availability of salvage; at no time must action be taken which could interfere with action to preserve life and minimize personal injury or which could endanger the rescue craft or her crew.

SAR Prevention

1) In co-operation with governmental and private groups that have marine safety interests or responsibilities, to promote the highest practicable level of marine safety in order to minimize demands for SAR operations.

These objectives have the agreement of departmental management. They have not been confirmed by ministers.

Planning Process

3.50 Within the Marine Administration and the Canadian Coast Guard, two levels of approval documents are used in the program planning process. At the corporate level which reviews all projects of $3 million and over, the Approval in Principal Document (APD) provides the bridge between long-range plans and projects. It identifies a problem, rationale, the policy supported, an initial estimate of personnel and costs, potential risks and other implications.

The Program Approval Document (PAD) provides the allocation of resources to a project in the Transport program plan. It is also the basis for inclusion of a project in the Program Forecast. The intention is that the PAD should contain sufficient detail for Treasury Board submissions where required.

3.51 The CCG and its five regions use APD/PAD decision documents primarily for capital projects and certain personnel and O & M projects. Figure 3-7 shows approval authorities:

FIGURE 3-6
APPROVAL AUTHORITIES
CCG PROJECTS

	CCG	
Regional Directors	$ 15K	$250K
CCG	$250K	$1 M
Marine Administration	$1 M	$3 M
Transport Planning Committee	$3 M +	

3.52 The purpose of reviews by the authorities is to ensure that projects and programs are adequately planned and documented with sufficient lead time to allow more detailed planning prior to the development of Main Estimates Submissions.

3.53 The responsibility for SAR planning at the headquarters level of the Marine Administration lies with the Chief, Search and Rescue, who reports to the Director of Fleet Systems of the Canadian Coast Guard.

3.54 The development of the CCG component of the operations element of the National SAR Plan commences at the regional level with an analysis of needs and anticipated coverage based on existing resources, indication of shortfalls, characteristics of the shortfall and its causes, with alternative recommendations for meeting such shortfalls. Following interdepartmental discussion at the regional level among DND, DFO and DOT, the CCG Proposals are costed, the Regional SAR Manager develops a recommended regional CCG plan and transmits it to the Director, Fleet Systems at headquarters. The Chief, Search and Rescue reviews the regional recommendations and the final selection is costed and transmitted to the CCG member of the ICSAR Secretariat who signs off the recommendations before they are presented to ICSAR. Co-ordination of the CCG element of the plan with the DND and DFO component is achieved through regional meetings, chaired by DND/RCC.

Planning Concerns

3.55 Interviews with regional and headquarters personnel indicate that CCG proposals for inclusion in the National SAR Plan have not been altered in senior management reviews. The fact that DOT has not been obliged to absorb the costs of any of its SAR proposals, as DND has, may be a factor which allows such an approach. Further, until recently, the mismatch between SAR, the governmental resource allocation cycle and pressures to improve marine response have resulted in SAR planners being given considerable latitude. In addition, during the last two or three years there is evidence of increasing concern amongst marine SAR planners concerning the adequacy of air response and coverage for marine incidents, particularly with Victoria SRR, which is reflected in ICSAR minutes.

3.56 A review of ICSAR minutes and SAR plans indicates that with the exception of Boating Safety Education and increased use of television and other media for public education on marine safety which are the responsibility of the Chief, Search and Rescue, there has been little response to the ministerial direction of November 1976 that greater priority should be given to SAR prevention. Discussions with CCG and ICSAR Secretariat staff indicate that the SAR division is seen as being responsible for policy and programming on SAR prevention, and that the skills, knowledge and experience of the Ships Safety Branch on safety, education, inspection and enforcement, are not being fully utilized.

Observations

3.57 1. There are no ministerially approved strategic or program objectives for SAR operations or prevention activities.

2. There has been some response, by way of additional education and promotion efforts, to ministerial direction that greater priority be given to the prevention of SAR incidents.

3. Full advantage is not being taken of the skills, knowledge, experience and staff of the CCG Ship Safety Branch to give stronger impetus to the development of marine SAR prevention proposals.

Department of Fisheries

Objectives

3.58 A TBS working group proposed objectives for the Department of Fisheries and Oceans to ICSAR in 1979 as follows:

SAR Operations

To assist agencies with primary SAR responsibility through the provision of multi-tasked SAR resources, to the extent practicable.

SAR Prevention

(1) To maintain awareness of safety implications in all aspects of the planning, management and execution of departmental programs.

Planning Process

3.59 DFO vessels are part of an overall federal marine SAR response system by virtue of a 1951 Cabinet Directive. Thus, DFO vessels are subject to SAR tasking in the event of an incident. This additional responsibility remained undefined until the concept of multi-tasking was introduced in 1976. The rationale for the introduction of multi-tasking was that government vessels are major capital investments which were not being utilized to the maximum extent possible when on day operations. It was felt that Search and Rescue was an activity compatible with normal DFO program functions and therefore these vessels could perform a SAR role during non-program times. These time periods fall into two general categories: (a) relatively long continuous intervals, and (b) nights and weekends. This division has resulted in the corresponding division of multi-tasking types: primary where a vessel is, in effect, contracted to a primary SAR commitment for a specified period of time. This vessel may be from any department and is used mainly to cover refit periods of Coast Guard SAR vessels; and, secondary where a vessel is provided with an incremental operating capability to permit an operating or a standby arrangement that makes the vessel more available to SAR than would otherwise be the case.

3.60 Planning for the use of multi-tasked vessels is initiated at the regional level in the preparation of the annual SAR Plan. At that time, Coast Guard officials provide an assessment of marine SAR demands in a particular SRR and, if other resources are insufficient in capability or availability to meet these perceived demands, DFO will be asked for proposals of vessels that could be multi-tasked in those areas and time periods. DFO fisheries patrol craft generally follow and monitor fisheries activities and will, therefore, usually be in the vicinity of fishing vessels. Since different areas of fisheries open and close at different times however, these patrol craft will be in transit to these areas in advance of the major fishing fleet. While at sea, DFO vessels may be tasked to respond to a SAR incident as a vessel of opportunity and no reimbursement for associated expenses is expected or offered.

3.61 The proposals for multi-tasking are reviewed at DFO headquarters in the Ship Branch which, in general, accepts the regional recommendations. A further Coast Guard review of these proposals takes place during the consolidation when CCG recommends final levels to ICSAR and forwards them for programming approvals. Ceilings are approved and, when the fiscal year commences, operations begin as reflected in these ceilings. Recovery of funds is sought once annually. This submission is made to the ICSAR Co-Chairman for confirmation and it accompanies a Treasury Board submission for release of funds.

Planning Concerns

3.62 Discussions with regional and headquarters CCG and DFO staffs indicate that there are a number of concerns on both sides which are precluding full use of DFO resources either in multi-tasking or as vessels of opportunity and that inhibit the fullest co-operation of the two departments in the development of the National SAR Plan.

3.63 While general guidance on the costing of multi-tasking has been provided by a 1979 TB Minute, this has not been translated into detailed guidance or accounting principles and allowable incremental costs. Accordingly, each of the regions follows its own approach to costing its multi-tasking proposals. This lack of uniformity leads to a Coast Guard concern that the costs being attributed to multi-tasking may not be fair and reasonable.

3.64 A further difficulty is that while, in general, it is possible at the time of preparation of the annual plan for DFO to indicate the location of fisheries patrol vessels, the location of fisheries research vessels is more uncertain. These uncertainties provide the basis for a CCG argument that if the vessels may not be available they should not be built into the plan and therefore, if there is a gap in coverage, CCG vessels must be provided.

3.65 A further point of concern is that when a new CCG vessel is put into the plan, there may no longer be, on the basis of the perceived need for coverage, a need for multi-tasking. Consequently, since 1980/81, multitasking has been less relied upon. The feeling in DFO is that a cost effective solution to coverage has been replaced by an expensive solution, a dedicated SAR vessel.

3.66 Finally, in some instances where DFO ships have been dropped from multi-tasking, they have been asked to respond to a large number of incidents (e.g. 50) per year with a consequent unplanned interruption of their fisheries programs and without recompense. DFO considers this to be unfair since the SAR system obtains substantial benefits at DFO's expense.

3.67 DFO's perception of the difficulties of convincing CCG of the continuing advisability of multi-tasking in instances where new CCG dedicated SAR vessels have been put in place has led to a mutual lack of confidence between CCG and DFO. Although the Ship Branch in DFO headquarters has a person-year for SAR planning purposes, the position has been vacant for more than a year. The work of reviewing regional proposals, the maintenance of records on the amount of multi-tasking and advice to the DFO ICSAR member is being divided amongst existing staff.

3.68 It is also apparent that plans do not make full use of DFO's small fisheries patrol vessels or the Parks Canada or smaller RCMP boats as ships of opportunity because of the lack of facilities for rapid communications with these vessels. Further, not all larger vessels of government fleets which could and should respond as vessels of opportunity have special equipment which would enhance their capability. For example, while fisheries management vessels have a boarding boat suitable for SAR, not all government vessels of similar size do. The cost of equipping such vessels with boarding boats, VHF/DF (both FM and AM), pumps and portable fire fighting equipment would range from $30,000 to $50,000 per vessel. Given that it is clear that vessels of opportunity frequently proved the fastest response to a distress, this would appear a highly cost-effective approach. Also the preparation of the National SAR Plan does not make full use of the local knowledge of hazards and needs for coverage which these small patrol vessels acquire during operation. These considerations have led the Team to further examination of the multi-tasking issue.

The Multi-Tasking Issue

3.69 The annual SAR Planning process is structured to recommend planned SAR coverage by sub-areas across the country. The Department of Fisheries and Oceans employs a sizeable fleet in conducting its activities and only a fraction of these vessels is formally multi-tasked in this planning process. The remaining DFO vessels, of course, continue normal operations within these SAR sub-areas. As a result, SAR planning does not consider these other vessels as providing a capability which could be built into planned SAR coverage. That is, in planning terms, these vessels are not part of the SAR requirements analysis.

3.70 Some of these vessels operate on a twenty-four hour, seven-day a week basis in carrying out their program functions. Others do not. The seminal multi-tasking rationale was to make greater use of costly capital investments (DFO vessels) by extending their availability to carry out compatible functions such as SAR and fisheries patrol. The result of this is that two activities occur simultaneously during periods of multi-tasking. These activities are normally carried out by two separate departments. They are both, however, activities that should be carried out on a 24/7 basis. Both SAR incidents and fisheries violations may occur at any time. As indicated, a 1951 Cabinet Directive identifies all federal government vessels as part of a federal SAR response mechanism. This being the case, it would not be illogical for all fisheries management vessels to be tasked to their maximum number of available response days. In this instance, a degree of additional 24/7 SAR coverage would be provided, fisheries management activities would be extended and the intent of multi-tasking would be fulfilled.

3.71 The corresponding increased SAR coverage would then be available to RCCs and form part of the national SAR system. This coverage must then be considered in the development of SAR capital proposals. There would be a need only to identify areas where (a) there is a demonstrable SAR demand, and (b) there is no 24/7 SAR coverage from either CCG or DFO vessels in the area, before CCG increased capital acquisition might be justified. In addition, the Fisheries Management Program would be enhanced and, in many cases, during times where fisheries violations would be most likely to occur i.e. those times when Fisheries Patrol craft are not normally operational.

3.72 If funding to allow for this extension were provided through DFO budgets, the need for Coast Guard to be involved in assessing costs attributable to marine SAR from DFO involvement would be unnecessary. The ICSAR Co-Chairmen and the Secretariat are in an awkward position at the moment in confirming to the Treasury Board that the costs claimed for multi-tasking DFO vessels are realistic since no agreed formula exists and the ICSAR Secretariat does not have access to complete DFO financial information. Budgeting for these funds, being outside normal departmental procedures, is awkward and not subject to usual accounting practices. With this funding in the DFO 'A' base, planning for the use of DFO vessels would be greatly simplified and misunderstandings between departments, which have adversely affected optimum planning, would be eliminated.

3.73 The appropriate RCC must be kept informed of vessel status and position. With increasing use of DFO vessels, there may be a corresponding demand on DFO program time which should be largely offset by a 24/7 operation. In any event, in order to identify overall costs of SAR and possible impact on Fisheries activities, an agreed formula of costing DFO operations should be derived.

3.74 Some CCG helicopters which are suitable for use as SAR response vehicles might be equipped with additional SAR equipment including a portable hoist such as the one developed for use in the U.K. The helicopter crews would require SAR training and would have to maintain this level of proficiency.

3.75 In some areas of the country it might be beneficial to contract for SAR helicopter services with a private company. In the more remote areas where it may prove difficult to meet a level of service standard such an arrangement should be evaluated. Once again the helicopter would have to carry additional SAR equipment and crews would require training to the SAR standard.

Observations

3.76 1. There are differences in DFO and CCG perceptions as to the need for, and desirability of multi-tasking arising out of lack of an agreement on what costs should be attributed to SAR and CCG's view of the risks which can be borne in making plans to fill perceived gaps in coverage when the location of DFO ships is uncertain in the planning horizon.

2. CCG has assumed the responsibility for deciding the level of multi-tasking. This has not been accepted by DFO.

3. DFO no longer participates actively in the work of the ICSAR Secretariat, and is not being called on to do so.

4. Some government vehicles suitable for SAR response as vehicles of opportunity do not have the necessary equipment.

5. SAR helicopter coverage might be provided by the private sector under contract.

Conclusions

3.77 1. Full use is not being made of DFO's fleet to provide SAR coverage nor is the present approach to multi-tasking and to ship capital acquisition planning optimum, when viewed from an overall viewpoint of total costs and benefits to the combined SAR fisheries patrol and fisheries research programs.

2. This results from concerns in both departments which must be addressed if full advantage is to be derived from multi-tasking.

3. A set of guidelines covering accounting principles and allowable costs, including attributable overhead for multi-tasking, is required.

4. An analysis is required, in the context of the DFO fisheries and research programs and the SAR program, of the extent to which the operations of DFO vessels with a SAR capability could be extended to 24 hours, 7 days per week during their maximum available response days, including:

   - costs involved
   - benefits to SAR program
   - benefits to fisheries patrol and research programs
   - possible offsets from new SAR vessel acquisition
   - possible offsets from new fisheries vessel acquisition

5. If the benefits and offsets justify the extension, the necessary funding could best be justified and obtained through the DFO estimates.

6. A substantially improved SAR capability for government fleets as vehicles of opportunity could be obtained for modest expenditure.

7. The use of contracted helicopter services should be considered for the more remote areas.

SECTION 4 - ANALYSIS OF SAR MANAGEMENT AND FINANCIAL CONTROL

Management Information System

Existing SAR Statistical System

4.1 Since 1976 information on each incident reported to the RCC is recorded and then transferred to sheets which are laid out in punched card format. Each field or data element is described in CFP 209. The punched cards are then processed through a DND computer to provide quarterly and annual summaries of the incidents.

4.2 The following findings have been derived from interviews with operational and headquarters personnel and as a result of analyzing existing SARSTATS:

(1) There is no agreement among the departments involved, DND, DFO and DOT, as to what information must be provided.

(2) DND, as the lead department and provider of the infrastructure, has been reluctant to amend the system because of manpower shortages.

(3) CCG has not pushed hard enough for changes and improvements and has instead been working to develop its own system.

(4) Recent attempts to improve the system i.e. from MK I through MKI Enhanced, MK II to MK III and the movement of the data base to another computer have not considered program analysis needs.

(5) There is a lack of programs to manipulate data and program analysis must be based on time consuming 'by hand' manipulation.

(6) The definitions of the data elements in SARSTATS are interpreted differently by the RCCs because of lack of precision in definitions and guidance on interpretation.

(7) The validity of the data is questioned by CCG. The definition of 'distress' is stated as being "an incident where in the opinion of the RCC Duty Controller one or more lives were in jeopardy". The RCC Controllers are DND personnel and the Coast Guard Rescue Officers and Watchkeepers are there only to provide advice with regard to marine incidents. The opinion of the on-scene commander, if there is one, should also be recorded.

(8) The data entry system is archaic and cumbersome.

(9) Little or no training has been given to commanders of dedicated SAR response vehicles on the completion of SAR forms.

(10) Information for statistical puposes is difficult to obtain from vessels of opportunity.

(11) CCG is experimenting with a new SAR reporting form.

(12) DFO has not been consulted about either changes to the existing information requirements or the new CCG reporting format.

(13) There is no check on the accuracy of the information.

(14) There is little evidence that data is regularly utilized for program management purposes.

(15) Data for most SAR studies is analyzed manually.

(16) Data from the Aviation Safety Bureau of CATA, Casualty Investigations (CCG) and Coroner's reports is not being regularly analyzed and data entered into the SAR information system.

(17) Data from the Ships Activity Recording Systems (SARS) is not being utilized.

(18) The SAR vessels should be numbered consecutively within their class i.e. Grenfell = 601, Jackman = 602 etc.

Conclusions

4.3 The following conclusions can be derived from these findings:

(1) No new or amended SARSTATS system, either from the input or the output point of view, should be developed until unanimous agreement of the three major organizations, DND, TC and DFO, is obtained through ICSAR and its Secretariat, who should be program managers for the SAR management information systems.

(2) Criteria must be established for analysis of the program before data base requirements can be determined.

(3) The use of a system incorporating Mark-Sensing and Optical Character Recognition, such as that used by the Government of Ontario Ambulance Service, should be closely examined.

(4) Separate inputs from the RCC and the responding vehicle commanders would permit an analysis of the interpretation of incidents as seen through the eyes and ears of the SAR personnel.

Financial Information Systems

Program Costs

4.4 Good financial reporting systems are essential if the trade-offs which appear desirable in the SAR program are to be made with confidence. As in any program which is co-ordinated on an interdepartmental basis, it may be expected that unless particular attention has been given to achieving a uniform basis for costing, aggregate program costs will have to be based on existing departmental financial information and that treatment of costs may not be uniform.

4.5 For the Coast Guard, the activity structure provides discreet representation of the SAR activity in both Main Estimates and Public Accounts. While accuracy problems exist in this structure, the reported expenditures are discreet and auditable and provide the best available reporting method for dedicated units.

4.6 The DND activity structure does not isolate SAR and for that reason, SAR expenditures are not readily extracted from DND FIS. Currently, D Cost S provides SAR financial information via cost accounting methods. Altering activity structure within DND to provide a discreet SAR activity would be beneficial as it would provide ICSAR with M.I.S. input from DND FIS and would close the loop for DND for SAR financial information. Variances between cost accounting reports and expenditure reports would be useful for internal adjustments.

4.7 DFO's vessels are not SAR dedicated resources and for that reason, information capture is more difficult. This difficulty is illustrated by the large discrepancy between DSR and the Resource Expenditure Report, the two available systems.

4.8 It would be difficult to solve the data capture problems in DSR as DFO's vessels are non-SAR dedicated and SAR costs are difficult to translate into the expenditure system. What would be needed to ensure accuracy in the Resource Expenditure Report would be a discreet method of costing for multi-tasked vessels coupled with a management focal point within the system. To accomplish this, a costing method could be developed by an independent body, for example, the Audit Services Bureau. Its standard application could be ensured by empowering DFO Ship Branch to oversee and enforce uniform application of the costing method once developed.

Personnel, Operating and Maintenance Costs

4.9 The Team encountered considerable difficulties in costing alternative scenarios for marine operational response. The lack of ready availability of the necessary financial data suggests that analysis of the mix of forces has not had a high priority and conversations with DFO and CCG staff confirm this. Particular difficulty was encountered in costing DFO multi-tasked vessels.

Observations

4.10 (1) ICSAR does not have available to it the financial information required to verify that multi-tasking charges are appropriate.

(2) Identifying SAR as a discreet activity within DND would provide a basis for improving the financial information available within DND and the ICSAR concerning the DND component of SAR program costs.

(3) Differences between departmental financial resources data in form and content result in inconsistencies in the determination of SAR program costs.

(4) No information was readily available on the costs of SAR prevention activities.

Conclusions

4.11 (1) ICSAR does not have available to it consistent or accurate costs for the SAR program.

(2) Improved financial information must be developed at the departmental level if useful and reliable information is to be available concerning cost-effectiveness of the SAR program.

SECTION 5 - DISCUSSION AND SUMMARY CONCLUSIONS ON SAR MANAGEMENT

Introduction

5.1 The preceding examination of the organization, departmental process and information system for SAR strategic and program planning, together with work done in previous parts of the evaluation report, suggest that some reconsideration is desirable of the details of processes of SAR planning and programming, in the context of the management mode established by ministers in 1976.

5.2 The Interdepartmental Committee on Search and Rescue established in 1976 was charged to give advice on policy, planning, resources and effectiveness and also with the development of a National SAR Plan for annual review by the Treasury Board and the Ad Hoc Committee of Ministers on Ocean Management. In the plan, the need for primary SAR response was to be identified, justified and matched against available capacity. This latter requirement clearly grew out of the skepticism which had led to the 1976 Task Force Review of SAR, that current Coast Guard planning for substantial additional primary SAR vessels represented the most cost-effective means of meeting SAR needs. Amongst the Task Force recommendations accepted by ministers at that time, was that multi-tasking should be relied on to a greater extent, that a CMRA should be formed and that priority should be given to SAR prevention.

Discussion and Conclusions

5.3 The preceding analysis suggests that SAR planning for marine resources does not make a convincing case. That it is not convincing is patently evident from the fact that no new capital but only replacement of existing capital for marine resources has been approved for 1980/81 or 1981/82. The analysis also suggests that the financial and manpower constraints of the defence envelope have inhibited DND from making resource requests. Further, the departments concerned are deciding the amount of resources requested rather than an overall view developed by ICSAR. In addition, in spite of repeated ministerial direction since 1976 that SAR prevention should be given priority, there has been little response from DOT in the areas of inspection, regulation and enforcement directed at the reduction of SAR incidents, apart from the CCG BOSDET and media program. Moreover, DOT/CATA does not appear to accept any responsibility to respond to this direction. Thus the 1976 objective of ministers that the SAR program should reflect government prioritiies for meeting SAR needs is not being realized.

5.4 The Team concludes that:

(1) Ministers' purpose in creating ICSAR that the SAR program reflect ministerial rather than departmental priorities for SAR, has not been met.

(2) The SAR Program is still mainly a collection of activities whose direction and level of effort is determined by departments concerned rather than by an analysis of trade-offs or cost-effectiveness of various means of meeting overall SAR program needs.

(3) Ministers collectively are not receiving the information they require to make informed decisions about the level of SAR operations, prevention, alternative ways of delivering SAR response or on how programs impinging on SAR affect or could affect the need for SAR.

Definition of SAR

5.5 In Canada, "Search and Rescue" is what a search and rescue service does. The term Search and Rescue is nowhere defined in CCG or Canadian Forces operations manuals, or in policy directives. In the United States "Search and Rescue is the use of available personnel and facilities in rendering aid to persons and property in distress" (National SAR Manual, 1961). In Australia "Search and Rescue (SAR) comprises the search for and provision of aid to persons who are, or are feared to be, in distress, or immediate danger, within the area for which Australia has accepted responsibility" (SAR Manual, Australia). In Canada, in the absence of ministerially approved objectives, SAR is as SAR does.

Federal, Provincial and Local Authorities and Responsibilities for SAR Operations

5.6 Unlike the practice in the U.S.A. and Australia, in Canada the responsibilities of various national, provincial and local authorities and the various federal SAR forces are not clearly defined relative to each other, nor are the circumstances clearly set out under which responsibilities should pass from one authority to another. Thus, neither SAR operational forces including RCCs, nor those responsible for SAR prevention, nor SAR planners have, as is desirable, a clear or common concept of where their responsibilities for SAR begin or end. By way of example, RCCs are not clear on the extent of their responsibility to respond to marine distresses on inland waters or to co-ordinate the response of non-federal authorities. BOSDET teams spend a substantial portion of their time on presentations to persons who do not operate in waters for which the CCG has responsibility, nor is the responsibility, if any, to provide dedicated marine resources to respond outside territorial waters established.

5.7 There is a tendency, particularly for marine SAR planners and forces, to assume the responsibility for response to incidents which in other countries would be the responsibility of state and local authorities. In Australia, for example, state authorities are responsible for small craft in inshore waters along the Australian coast. In contrast, Canadian Coast Guard Planners, instead of working with or through the British Columbia Provincial Emergency Programs office which was already active in establishing volunteer groups, established a parallel CMRA organization. A more pragmatic approach is being taken in establishing CASARA, where provincially sponsored groups will be affiliated through the national organization and the option of federal support for groups through PEP remains open. Reconsideration of the approach to CMRA organization on the West Coast, particularly for groups covering sheltered coastal waters, might solve difficult organizational problems now arising with west coast volunteers. It should also be noted Ontario Provincial Police have shown a willingness to assume responsibilities at least in close inshore waters in certain areas of the Great Lakes, as shown by the placement of police vessels. Certain harbour authorities, for example the Toronto Harbour Police, have shown a similar inclination.

5.8 It should be noted that under ICAO, IMCO and SOLAS agreements, the acceptance of responsibility for coverage in offshore waters does not imply the provision of any particular level of service, that coverage should be by primary SAR vessels and aircraft, or that such coverage should extend to the far reaches of the boundaries of the area for which responsibility has been accepted. The requirement is that RCCs be in a position to communicate with and co-ordinate the response of vessels of opportunity. In Australia, authorities make it clear that their responsibilities do not extend beyond this and that capabilities to do more than this are very limited. It appears that the implicit policy is that there is no responsibility to provide dedicated SAR response out to the boundaries of the Canadian area of responsibility. It is also noted, however, that Halifax SRR has repeatedly drawn the attention of NDHQ to the inability of SAR forces to provide coverage out to the boundaries.

5.9 As an initial step in clarifying responsibilities, the federal role needs definition. This definition should reflect the fact that Canada has accepted responsibilities under the ICAO and IMCO agreements to provide an organization to co-ordinate response over certain areas and that Cabinet has in turn, by virtue of a number of directives, defined the extent of federal responsibilities in these matters. The Team has accordingly defined the federal role in search and rescue as:

> "The federal role is to provide for air and marine search and rescue wihtin the area for which Canada has accepted responsibility".

5.10 For clarity, and as a basis for future consideration of the desirability of provincial and local authorities assuming some responsibility for close inshore waters, at least on the Great Lakes, a codification for existing relative responsibilities appears desirable. Consistent with this definition of the federal role, the Team has also provided a summary codification of the responsibilities of other jurisdictions, which is set out in Table 5-1. The codification should be, and is believed to be, consistent with existing agreements between SRR commanders and provincial and local authorities. This codification is a recognition of the current state of affairs, and does not therefore take into account the fact that as a matter of policy in the future, the federal government may wish to encourage provincial and local authoritis to assume greater responsibilities.

Table 5-1

SEARCH AND RESCUE RESPONSIBILITIES

	IN RESPECT OF CIVIL VESSELS IN INTERNATIONAL AND FEDERAL WATERS		IN RESPECT OF CIVIL AIRCRAFT		IN RESPECT OF MILITARY AIRCRAFT OR VESSELS		IN RESPECT OF HIKERS, ETC, LAND VEHICLES AND SMALL CRAFT IN PROVINCIAL OR TERRITORIAL WATERS	
1 FUNCTION OR TASK	2 RESPONSIBLE	3 ASSISTANCE WHERE NECESSARY	4 RESPONSIBLE	5 ASSISTANCE WHERE NECESSARY	6 RESPONSIBLE	7 ASSISTANCE WHERE NECESSARY	8 RESPONSIBLE	9 ASSISTANCE WHERE NECESSARY
OVERALL COORDINATION OF LAND, SEA AND AIR SEARCH a	RCC/SAREC	-	RCC	-	DND	-	POLICE	-
ARRANGEMENT FOR OR PROVISION OF SEARCH AIRCRAFT b	RCC	DND CASARA USCG	RCC	DND CASARA USAF/USCG	DND	RCC USAF USCG CASARA	POLICE	RCC CASARA DND
COORDINATION OF SEARCH BY AIR c	RCC	DND USCG	RCC	DND USAF/USCG CATA/FAA CASARA	DND	RCC CATA/FAA USAF/USCG	RCC	CATA DND POLICE CASARA
PROVISION AND CO-ORDINATION OF SEARCH/RESCUE ON LAND d	RCC/SAREC	POLICE CCG/USCG DND	RCC	DND CASARA USAF POLICE CATA/FAA	DND	RCC USAF CASARA POLICE CATA/FAA	POLICE	DND CASARA
AIR-GROUND COMMUNICATIONS FOR LAND SEARCH/RESCUE e	RCC	CCG DND POLICE USCG	RCC	DND CATA/FAA USAF	DND	RCC USAF CATA/FAA	RCC	CATA DND POLICE CASARA
ARRANGEMENT FOR OR PROVISION OF SEA SEARCH f	RCC/SAREC	CCG/DFO DND CMRA	RCC/SAREC	DND CCG/DFO USCG CATA/FAA	DND	RCC USCG USAF CCG/DFO	POLICE	RCC/SAREC CMRA CCG
COORDINATION OF SEARCH BY SEA g	RCC/SAREC	DND CCG/DFO USCG	RCC/SAREC	DND CCG/DFO USCG CATA/FAA	DND	RCC/SAREC USCG CCG/DFO CATA/FAA	POLICE	RCC/SAREC CCG DND CMRA
COMMUNICATIONS (OTHER THAN AIR/SURFACE) h	RCC/SAREC	CCG/DFO DND USCG	RCC	DND CCG CATA/FAA USCG	DND	RCC USAF/USCG CATA/CCG/FAA	POLICE	RCC CATA/CCG DND
AIRCRAFT/SHIP RELAY COMMUNICATIONS WHERE DIRECT COMMUNICATIONS NOT AVAILABLE i	RCC	CCG/DFO DND USCG CMRA CATA/FAA	RCC	DND CCG USCG DFO CMRA CATA/FAA	DND	RCC USCG CCG/DFO CATA/FAA	POLICE	RCC CCG DND CATA CASARA

5.11 A definition of the geographical area of Canadian responsibility also appears desirable. The Team has also, consistent with the preceding discussion provided a definition of the extent of Canadian responsibility for response to air and marine distress which is believed to be consistent with ICAO and IMCO agreements, and previous Cabinet directives as follows:

> "The Canadian area of responsibility for air and marine search and rescue is as provided for under ICAO agreements, air search and rescue covering Canada and out to 30° West in the Atlantic and 145° West in the Pacific, and under IMCO agreements, marine search and rescue on the Great Lakes, the St. Lawrence River and waters out to 30° West in the Atlantic and 145° West in the Pacific."

Conclusions

5.12

(1) The Team's definition of the federal role, of other jurisdictions and of the geographical area of Canadian responsibility for search and rescue which is consistent with international agreements and existing Cabinet directives, should be confirmed by ministers.

(2) The possibility of encouraging other jurisdictions to play a greater role particularly in marine search and rescue, at least for small craft in close inshore waters in the Great Lakes, and in the support of volunteers in British Columbia, should be explored, since this could lead to substantial economies and a better national SAR response system.

(3) The federal government's policy concerning the provision of coverage in far off-shore regions should be explicitly defined.

SAR Program Objectives

5.13 The analyses, in the various parts of this volume and the more detailed analysis of SAR planning and control, provide ample evidence that the objectives and tasks of the SAR program are not adequately or precisely defined. It is also clear the lack of interdepartmental consensus on what they are or should be, has frustrated repeated attempts to develop them.

5.14 The objectives for SAR developed for ICSAR by the 1979 TBS working group have more the characteristic of activity statements than objective statements. They do, however, in the opinion of the Team, represent clear and compatible statements of the respective responsibilities of the departments involved in SAR operations and prevention activities, to the extent that SAR planners and managers could agree on them. However, departments have not agreed to these objectives or those in SARCORE. In addition these proposals take no account of the important part that "activities which impinge on SAR" play in providing effective and efficient

SAR operations, or in ensuring safe conduct of air and marine flights and voyages. As well, they propose divisions of responsibility between departments which leave gaps in assigned management responsibility for various elements of the SAR program as described by the Evaluation Team.

5.15 Attempts at definition have been unable to overcome the following obstacles, identified during interviews with departmental staffs, to achieving sufficiently precise agreed objectives and tasks as a clear guide to relative departmental responsibilities for SAR operations and prevention:

(1) The term SAR or SAR Program has not been defined. There are different perceptions in CATA, CCG and DND on what the ambits of the term SAR and SAR Program are.

(a) CATA has, only with great reluctance and on an ad hoc basis, accepted that it has any responsibilities for SAR. The ad hoc approach to the resolution of ELT difficulties, the unwillingness to accept any responsibilities for the SARSAT program, and the lack of substantive program response to ministerial direction that priority be given to SAR prevention are a reflection of this CATA perception.

(b) DND feels strongly that federal leadership in improving the detection and location of SAR air incidents is a CATA responsibility and believes that CATA's SAR objectives should reflect this. ICSAR minutes and correspondence between the two departments concerning ELTs and SARSAT amply demonstrate DND's concern and CATA's unwillingness to accept this particular responsibility on a continuing basis.

(c) CCG implicit SAR objectives include responding to non-distress and its marine resource requests and postures reflect this. Further, CCG acts as if it should be the prime federal instrument for marine response to marine SAR incidents. This is not accepted by DFO.

(d) DND is inclined to use a narrow definition of the term SAR and the geographical extent of SAR responsibilities whereas CCG inclines to a broader definition. This stems in part from a perception on DND's part that a broad definition would lead to further demands for air resources which would compete with defence needs, and on the Coast Guard's part by its perception that it is or should be the prime federal instrument for marine response and that it should have the resources to achieve this.

The Team is of the view that DOT's responsibilities for the alerting function should carry with it a responsibility to introduce and use new technology for this purpose, as well as to improve existing procedures. Accordingly DOT should assume the lead responsibility for this aspect of the SAR program.

Policies for Use of SAR Resources

5.16 A major concern stemming from this lack of clear objectives is that current proposals to ministers for additional resources are justified partly on the grounds of increases in incidents as opposed to distress incidents. Primary SAR CCG vessels spend a very high proportion of their time (86% of sailing hours over the last five years) responding to non-distress marine incidents. Neither CCG nor DND personnel suggest that responding to non-distress incidents can be construed as an explicit objective of the program. However, CCG operations staff and DND RCC staff agree that RCC controllers often do not have sufficient information to determine whether a call for assistance represents a distress or a non-distress. In the absence of policy guidance, they will play it safe. In addition, it may fairly be agreed that in the absence of aid, a nondistress marine incident may deteriorate to a distress incident, e.g. a vessel broken down which is not in immediate danger may eventually drift onto rocks. While it is recognized that numbers of incidents are an indication of RCC work-load, arguments are being made for operations resources on the grounds that non-distress represents a significant operations work-load, although response to non-distresses is not an approved objective. The right approach in the absence of such an objective is to argue as follows: "Our objective is to respond to distress. Accordingly, we must have the resources to do so. However, our policy is to use our resources to respond to non-distresses, which in the judgment of RCC controllers are likely to result eventually in mariners' lives being put at risk if not responded to when such a response can be made without jeopardizing capability to respond to distress". Because of the resource, the political consequences and the lack of an interdepartmental consensus, this aspect of SAR objectives must be agreed to by ministers. If non-distresses are to be resourced for, such responses should be part of the objectives; if not, policy guidance should be clear, which it is not. Similar concerns apply to the use of dedicated SAR forces for humanitarian and civil aid purposes. In the Team's view, these are not, if the meaning of words is to be observed, within the ambit of search and rescue, as the term is understood in other countries. Ministers have repeatedly called for policies covering such matters. To ensure that the necessary priority is given to this work, goals should be developed, for submission to ministers, of policies for SAR humanitarian and civil aid, and non-distress.

5.17 In its interviews with both SAR personnel and volunteers, the Team heard much criticism of the concept that a "free automobile towing service" should be provided to pleasure boaters who run out of fuel, or experience mechanical failure, or who need a tow. The Team was persuaded that this encouraged the few, did not generally discourage the many in unseamanlike behaviour, and added unnecessarily to the SAR incident workload. The Team is, therefore, of the opinion that policies for cost recovery are an essential corollory of policies for use of SAR resources. The Team noted that cost-recovery measures being proposed by the U.S. Coast Guard have been presented to the U.S. Congress. It also appeared desirable to many persons interviewed, that such policies should encourage the establishment of private sector services, and there was a view that current CCG policies discouraged the creation of such services.

Conclusions

5.18 Accordingly, the Team concludes that:

(1) Search and Rescue should be defined so as to exclude the provision of aid in non-distress, humanitarian and civil aid. Policies should be established for the use of SAR resources in these circumstances. As well, previous ministerial requests for policies for cost-recovery in these areas should be responded to.

(2) In developing these policies, the intent of the 1951 Cabinet Directive should be observed, that action should not be competitive with commercial interests and policies should encourage the establishment of services by the private sector.

SAR Program Structure and Departmental Objectives

5.19 A SAR program structure is another essential building block in achieving ministers' purposes of a SAR program which reflects government rather than departmental priorities for meeting SAR needs.

5.20 Consistent with the issues and areas of activity ministers have asked be dealt with under the National SAR Plan, the Evaluation Team has defined the federal SAR program as consisting of four program elements, that is management, operations, prevention and programs that impinge on SAR. It has also defined in detail the objectives and tasks of the operations and prevention elements. This framework, with the addition of more detailed definition of the management and programs impinging on SAR elements, would lay the basis for a consistent compatible definition of continuing, rather than ad hoc departmental responsibilities and objectives. It would be consistent with the need to achieve an integrated SAR program and the development of systematic trade-offs amongst and within program elements. It would also provide a framework for a long term program plan for SAR which allows for the long lead time between defining requirements and acquiring capital resources. The framework for the operations prevention and management elements is shown in Table 5.2

5.21 Proposals for departmental objectives must be developed within the context of such a program framework. This is essential to achieving an integrated SAR program whose scope is clear, if ministers are to be given alternatives that have been systematically developed with priorities thoughtfully established on a program rather than departmental basis, and if there are not to be gaps in departmental objectives. Neither the 1969 TBS working group proposals nor the SARCORE proposals for departmental objectives are fully satisfactory in this respect.

SAR PROGRAM OBJECTIVES, ACTIVITIES, TASKS

ACTIVITY OBJECTIVE	ACTIVITY	TASK
SAR OPERATIONS		
To know of actual or potential distress who is involved, where and when it occurs	ALERTING	DETECTING NOTIFYING LOCATING
To provide for timely arrival of assistance	RESPONDING	REACTING TRANSITTING SEARCHING
To provide necessary aid	AIDING	DEPLOYING ASSISTING EVACUATING
SAR PREVENTION		
To determine the causes of all aviation and marine SAR incidents	INVESTIGATING	ANALYSING COMMUNICATING MONITORING
To provide SAR prevention standards	REGULATING	FORMULATING REVIEWING COMMUNICATING INSPECTING
To ensure compliance with SAR prevention standards	ENFORCING	ANALYSING COMMUNICATING APPLYING MONITORING
To make aviation and marine publics aware of SAR prevention measures	PROMOTING/ EDUCATING	DEVELOPING TARGETTING MONITORING
SAR MANAGEMENT		
Alternative I - To plan, program, monitor and evaluate the overall SAR program	PLANNING PROGRAMMING MONITORING EVALUATING	
Alternative II- To manage the SAR program including control of financing	ALL MANAGEMENT FUNCTIONS	

5.22 The Team further concludes that:

(1) There is a need for policy statements on scope, objectives, and definitions for the federal SAR program and its relation to other programs, in order to remove uncertainty in planning and priority setting, and to enable precisely defined alternatives and their resource implications.

(2) The various elements of the National SAR Program should be defined with the responsibilities for planning and execution clearly set out and assigned to departments. Departmental objectives should reflect this assignment.

(3) The Team's definition of the SAR Program as having the elements of operations, prevention, management, and programs impinging on SAR with objectives and tasks for the operations and prevention elements is consistent with the program issues and areas of activity ministers have asked to be dealt with and should be used as an initial basis for definition of the Program.

(4) There is a need for a single document or an integrated series of documents which define search and rescue (SAR), the SAR program and its objectives, the responsibilities of various national, provincial and local authorities for SAR response and the policies for the use of SAR resources for other than SAR objectives.

Alternatives and Trade-Offs

5.23 The SAR program framework suggested above would provide a basis for systematic development of trade-offs amongst the four main elements of the SAR program. These four elements offer an initial basis for considering program priorities. Ministers have previously directed that prevention should be given the highest priority. The Team has come to the view, although it cannot demonstrate it analytically, that this direction is likely to be the most cost-effective alternative. The Team's view is based on discussions with SAR experts and members of the public and also stems from the fact that the SAR system's performance is currently high, although it can certainly be improved. The recent DND/CCG review of the Victoria SRR shows that, of the lives being lost, many cannot be saved through an improved SAR response capability. This loss can only be avoided through substantial reductions in notification and decision times, improved SAR prevention and improvements in the programs impinging on SAR. The Team believes that priority should go next to improving the management of the SAR program. Next, priority should probably go to improving programs impinging on SAR, because of the importance to airmen and boaters of ready access to accurate weather information. It is also clear from the analysis in Part II and Part III of the Report that increasing the number of federal aircraft, ships and bases is probably not the most cost-effective way to shorten times to the incident site or to providing aid. More particularly, there has been no convincing demonstration that current SAR marine response capability is inadequate or that more cost-effective response is not possible. Therefore, given the high cost of primary CCG vessels and the low cost of volunteers, the Team would give the lowest priority to the provision of additional new vessels for marine response. Indeed, the current CCG approach to force postures will be unlikely to reduce the number of lives lost and, given public pressures for improvements is potentially open-ended in cost. On the other hand, high priority should go to reducing notification and decision times and, as the analysis in Part II and III shows, to making better use of ships of opportunity and volunteers. In suggesting such relative priorities, the Team has in mind relative rates of increase in person-years and money, not absolute values.

5.24 Alternatives for improvements must also be developed and considered within each of the four program elements. The detailed description of the SAR operation element developed by the Team, together with the SAR Time Line provide a basis for systematic consideration of alternatives for improving SAR response in the future. The proposed detailed description of the prevention element provides a similar framework for considering how the SAR program should seek to influence DOT's assignment of resources for education, regulation, investigation and enforcement.

Conclusions

5.25 The Team has proposed that standards for levels of service for SAR response should be developed and goals for achieving them established. Analysis of alternative SAR response postures and the costs of achieving them would accompany calculation of the existing levels of service. The Team's initial attempt at force mix analysis requires further refinement and elaboration. An operations research model currently under development by DND shows promise as a useful tool for such analysis and this together with work to further develop costing models for force posture analysis should continue under ICSAR's general direction.

5.26 Strategies for marine response alternatives to those currently being pursued by CCG need to be examined. The Team believes, on the basis of its analysis and discussions with SAR experts in Canada and the U.S.A., that the current CCG emphasis on the expansion of its dedicated vessel fleet should be reviewed in the context of the levels of service and goals approach suggested above. This emphasis is, in the opinion of many including the Team, probably not the superior strategy, as opposed to greater emphasis on multi-tasking, increased reliance on volunteers from both private groups and the CMRA, and greater use of ships of opportunity.

5.27 The Team further concludes that a better strategy to improve current response times could result from an appropriate mix, dependent on SRR characteristics, of the following elements:

(1) The establishment of standards for levels of service and goals for achieving them.

(2) The location and selection of primary tasked vessels, in particular higher performance lifeboats and cutters, to ensure that goals for the standards can be met under difficult sea, weather, and exceptional deployment needs with acceptable probability (i.e. 90 to 95% of the time).

(3) The consideration of the advantages and disadvantages of improved helicopter coverage to complement or as an alternative to additional primary tasked vessels.

(4) Expanded use of multi-tasking and of smaller, faster vessels, with CCG coxswain and crewed by CMRA volunteers, or fully manned by volunteers where volunteer participation warrants it, in high traffic sheltered and semi-sheltered waters, to enable average response times considerably better than the goal time.

(5) Greater use of federal fleets as ships of opportunity and of independent volunteer groups, through improvements in information available to the RCCs on their location and improved communications with them, to further reduce response time.

The Team's analysis of alternative marine scenarios in Part III Section 4 of this volume provides further information on how coverage and response time could be improved. Additional support for the Team's views on the desirability of making greater use of volunteers may be found in "A report on the Marine SAR Program in the Victoria Search and Rescue Region", August 1981, prepared by the DND/CCG Interdepartmental Review Team, extracts from which are attached as Annex VI-3.

Alternative Postures and Resource Levels

5.28 The Team notes that ministers do not regularly have an opportunity to consider alternative SAR operations postures and resource levels in the National SAR Plan. In general, DND posture studies have been undertaken in response to ministerial requests resulting from criticism of existing levels of service. Currently CCG determines CCG postures, multi-tasking levels and the extent to which volunteers are relied on. Ministers do not have the opportunity to consider other postures and resource levels than those recommended.

Conclusions

5.29 The Team believes that there are probably ways to improve response at lower cost, along the lines suggested above, and that ministers should have an opportunity to consider alternative force postures for four reasons. First, force postures resulting from greater use of volunteers and smaller, faster vehicles than currently in the CCG fleet offer the potential of much improved response times for relatively modest expenditure. Second, greater use of volunteers would build a sense of team work between the CCG and the public and would both reduce existing criticism and in the future, result in better informed criticism by the public, since volunteers would be well informed on the reasons for CCG postures and would carry this message to their home communities. Such results would be even more likely where CCG vessels were fully manned by volunteers, since the communities in which they were based would feel they were "our" vessels. Third, a requirement that alternative force postures be presented to ministers would help to ensure that ministers' rather than departmental priorities prevail. Finally, and conclusively, ministers have directed in the past that cost-effective alternatives be developed for their consideration.

Cost Effectiveness

5.30 The Team has not been able to determine the cost-effectiveness of SAR operations because the data required is lacking. Once objectives are agreed, the program framework, the SAR Time Line and the indicators suggested by the Team would provide a good start for determining operations effectiveness. The Team has not, in the time available, addressed suitable means for assessing the effectiveness of prevention measures.

Management Information

Conclusions

5.31 The operations indicators suggested by the Team, together with improved financial information, would fill management information gaps which have been extant far too long and which have been commented on regularly by control agencies and, including this evaluation, by three review and evaluation teams since 1974. The time taken to put this right has been unconscionably long, and again, in the Team's view, must be attributed in part to resource problems and lack of manpower, both within DND, CCG and the ICSAR Secretariat. The Team has noted with satisfaction, that a study is now under way to improve the management information systems and commends to its managers the work the team has done for this evaluation. The Team is also of the view that it is essential to maintain a single integrated information system with, if necessary, compatible additional modules which meet the particular needs of the various players.

Financial Control

5.32 The Team could not detect that ICSAR has had significant influence on the level of resources requested; and it is clear that the SAR Plan is mainly a programming document which is an aggregation or compilation of what DND and CCG separately decide should go forward. In DND's case, the Team is of the view that the constraint imposed by the Defence Services Program envelope has influenced, and continues to influence DND decisions on what resource proposals should go forward. As long as SAR is financed substantially out of the Defence Services Program, this will continue to be the case. It is clear from our discussions with DND personnel, both senior commanders and in the field, that proposals for SAR are seen to be in competition with other defence needs. The Team was also advised that as a result of being required in 1978/79 and 1979/80 to swallow resource requests within the DSP, DND decided not be put forward any requests in the 1979/80, 1980/81 and 1981/82 SAR Plans which could not be financed within the existing SAR committment. Furthermore, there are no attrition resources for SAR aircraft. Many SAR headquarters managers and planners have remarked that the fact that SAR needs are resourced both from the economic development and foreign and defence policy envelopes complicates and increases the time required to develop advice and to get decisions. (The Team can testify to this from its own experience on the basis of the number of persons in central agencies who had an interest in the evaluation and its findings, all of whom the Team found it prudent to consult.)

5.34 Accordingly, the Team is of the view that, if ministers wish to see a SAR Plan in the context of SAR needs, arrangements must be made to ensure that SAR needs are taken into account in setting the DSP envelope and that SAR receives a fair hearing within the DSP. Another possibility is to isolate the SAR program from the DSP and to cost it separately. This might be done by creating a separate DND vote for SAR, thus freeing SAR from the envelope constraint and DND manpower limit of the DSP. Still another possibility would be to finance the DND SAR activities through the Economic Development Envelope and include amounts for this purpose in DOT estimates. DND will feel particular financial pressures in this regard when it becomes necessary to incorporate the replacement of existing SAR aircraft in the LTP. The Team is also of the view that the Federal SAR Program must be financed from a single envelope if there are not to be continuing delays in taking decisions.

5.35 Closer control of SAR expenditures could be obtained if, in addition, the resources which CCG, DOT and other participants in the SAR program provide for SAR were under separate allotment control. This would help ensure that new funds received through the ICSAR process are spent for the purpose acquired, and that in "x" cuts the SAR program is considered as a whole rather than in parts by individual departments. Improved overall program control requires reconciliation of costing of the annual plan through agreed estimating procedures with reports on what is actually spent. In the absence of an integrated financial control document, an integrated plan will not be achieved; there will be little incentive to improve financial management systems; the costs of the SAR program will remain a partial mystery and there is no hope of satisfactorily measuring the cost side of cost-effectiveness.

Decision-Making Machinery

5.36 The present difference in DND, DOT/CATA and DOT/CCG perceptions of what the SAR program is and should be will not be easily or quickly reconciled. While ICSAR has provided a consultative forum which has, without doubt improved the ICSAR members' breadth of view, it has not been successful in reconciling the most contentious differences.

5.37 The persistence of these differences of view, which are evident throughout this volume of the Team's report and the slow progress in resolving them to achieve an integrated program, has led to continuous prodding from central agencies and ministers.

5.38 ICSAR, with two Co-chairmen in the persons of the DOT Commissioner of the Coast Guard and the DND Chief of Air Doctrine and Operations represents two organizations with very different points of view on SAR. With dual chairmanship, ICSAR is only successfully taking the lead in resolving issues on which both organizations can readily agree. Decisions and progress on the more contentious issues involving both departments are slow, or non existent to the considerable frustration of SAR managers, planners and operators, and the push to progress comes from central agencies and ministers. Thus ICSAR is largely a reactive body, rather than one providing strong leadership and direction. In the Team's view, it will remain so unless someone is put in charge at both the ministerial and the official level. An initial step in this direction would result from vesting responsibility and accountability for overall SAR planning and control in a single minister, advised by an ICSAR with a single chairman rather than co-chairmen, supported by an adequately resourced Secretariat having a single head.

5.39 The ICSAR is an advisory, rather than an executive body. Thus one must look elsewhere for lines of responsibility and accountability for planning, implementation, monitoring and evaluation of the SAR program overall. At the moment, the responsibility and accountability come together at Cabinet level. Given the Team's findings and the very heavy demands on ministers' time, some other focus than Cabinet for achieving an effective SAR program seems desirable.

5.40 The Team believes that the responsibilities of the lead minister for achieving an integrated plan should be set out. If lines of responsibility ran from the lead minister to the ICSAR Chairman, and on into departments to develop proposals for inclusion in the Plan, a single authority to place an integrated plan and contentious issues on the table for Ministers consideration would exist below Cabinet level. The Secretariat would be responsible for assembling the proposals into the Plan and recommending action to the Chairman. Departmental proposals should have the backing of their ICSAR representatives, who should have the authority to speak for their departments. The essence of this arrangement is that departments would propose what should be done, the responsible minister on the advice of the Chairman would decide what should be recommended to his colleagues, and departments would execute the program in accordance with the approved plan and retain control over resources.

5.41 It is evident that improvements to the SAR planning process and the content of the SAR Plan suggested above cannot be achieved without an adequately resourced ICSAR Secretariat and, in addition, improved analytical capability in the SAR division of CCG. The Team has learned with dismay of the number of vacant positions within the SAR division of CCG, given ministerial direction that SAR is a priority. DND has currently seven positions in DAOT5 to support SAR planning, but it is important that these positions be kept fully staffed. The development of a cost-effective national plan involves more than the aggregation of proposals received from departments. They must be analyzed by the Secretariat, the proposals initially offered must be questioned, departments must respond with improvements, and the Secretariat must be able to conduct trade-offs analysis. This can only be done by a Secretariat with the independence, time and skills to do so. The Secretariat would also co-ordinate the development of position papers on contentious issues. Decisions on them would be taken by the Chairman or the responsible minister with the advice of the chairman, or on the initiative of the responsible minister by interested ministers, or ministers collectively, when this is necessary for resolution. The Team believes that, based on the experience of other interdepartmental machinery, the Secretariat should, in addition to a head, have three full time officers, one of whom is skilled in planning and other techniques of analysis. It should have financial resources for studies to improve the planning and analytical processes and supporting information systems. To ensure its independence, the Secretariat should be established as a separate responsibility centre reporting, through its director, to the Chairman.

5.42 The Team notes that the organizational relationships and respective responsibilities of ICSAR members, the ICSAR Secretariat, SAR foci and other parts of departmental organizations in relation to each other are not clearly or fully set out. By way of example, the relative responsibilities of ICSAR, SAR foci, those responsible in the DOT air and marine safety organizations and the procedures required to get something done about SAR prevention, have not been systematically thought through. Until the procedures and relative responsibilities are established and accountability for SAR prevention tasks assigned, ministers' desires to give priority to SAR prevention are unlikely to be realized even if CATA were to accept responsibilities for SAR prevention. A number of responsibilities appear to be orphans. There is no focus for improvements to SAR program management overall, or for taking some initial steps to improve the co-ordination of SAR related research and development. As an aid to improving public understanding of the SAR system it is also, in the Team's view, desirable that an annual review of the causes, character and costs of SAR incidents be produced. Finally, there is a lack of co-ordination of SAR public information and relations programs which needs to be remedied if a better public understanding of SAR and individual responsibilities are to be obtained. The Team believes that decisions in these areas have also been delayed too long and that these can conveniently be considered part of the management element of the SAR program and accordingly the lead should be the responsibility of the management focus. The Team is also of the view that given the increasing importance and visibility of marine SAR, the SAR division of CCG should report to the Commissioner of the CCG.

5.43 The Team is of the view that if changes were made along the lines discussed above, the ICSAR machinery can be increasingly effective and ministers' expectations in establishing ICSAR are more likely to be achieved. Experience with other interdepartmental machinery, such as the Interdepartmental Committee on Space and on Energy R & D, give confidence that this is a reasonable expectation. However, if such machinery is to work well, experience also shows that ministers must give it strong backing and discourage the tendency of departments to go their own way. It is also absolutely essential that the Secretariat have adequate full time manpower and financial resources for studies.

5.44 Given the current DOT responsibilities for marine response and for air and marine safety, and the fact that the most important trade-off is more prevention as opposed to more operations, an argument can be made that, as in most other countries, the Minister of Transport should be designated the responsible minister. Given the opinion of the DOT Assistant General Counsel that the Aeronautics Act provides the authority for Canada to ratify the Chicago Convention and to implement ICAO Annex 12 (Search and Rescue) and that if there is a duty under the Aeronautics Act by reason of the Chicago Convention with respect to search and rescue on the civil aeronautics side, that responsibility resides with the Minister of Transport. Notwithstanding a Cabinet Directive of 1950, the Minister of Transport appears to have all the powers required to assume such a responsibility effectively. As matters now stand, the Minister of National Defence bears the responsibility of making the case for air response resources, while officials of the Air Administration feel no responsibility to reduce the pressure for additional resources through the taking of strong SAR Prevention action. Another possibility would be to assign the responsibility for the SAR program to the minister responsible for emergency planning, on the grounds that SAR is a response to an emergency and that this would help ensure that a national rather than a federal approach is developed.

5.45 It is also possible to argue that a greater centralization of planning and decision-making in a separate authority which would set the requirements and arrange with departments and the private sector for execution of the program and control resources would work even better than a strengthened ICSAR. Indeed, given the difficulties there have been in achieving an optimum SAR program this may, in the long run, prove the only effective organizational solution. The Team believes that serious consideration of such alternatives is warranted. Such studies would also give insight into what further changes in the ICSAR based machinery and process would be useful other than those the Team suggests. The outlines of two alternative organizations are contained in Annexes VI-1 and VI-2. The proposed strengthened ICSAR machinery would represent an evolution which could lead to or stop short of highly centralized machinery or the assumption by the Minister of Transport of the responsibility for the SAR Program. The evolution represented by the changes in ICSAR would not preclude leaving the responsibility with the Minister of National Defence, or assigning it to a third minister.

5.46 The Team, therefore, further concludes with respect to SAR management that:

(1) While considerable progress has been made since 1976, the existing planning process and content of plans requires further improvement, including the presentation to ministers in the National SAR Plan of alternative SAR program mixes and overall resource levels to help

ensure the SAR program does not remain a collection of activities, the proposed direction and level of which is mainly determined by the departments.

(2) The current arrangements for financial control of the SAR program are inconsistent with ministers' wishes that SAR planning be in the context of SAR needs overall, rather than departmental priorities.

(3) A single line of responsibility and accountability for planning, programming, monitoring and evaluation through a responsible minister should be established as an initial step in improving the rate of progress and quality of improvements in the federal SAR program. This should run from the departments concerned to a single chairman of ICSAR to the lead minister.

(4) The specific responsibilities of ICSAR, of its Secretariat, of activity and task co-ordinators for planning, program implementing, monitoring and evaluation of the federal SAR program, and of its overall policies should be defined.

(5) The nature of SAR requires that the SAR division of the CCG should report directly to the Commissioner CCG.

(6) Additional person-years and financial resources should be made available in the ICSAR Secretariat and SAR division of CCG, and current DND positions in support of SAR planning must be kept staffed to strength.

(7) Consideration should be given to the desirability of a single separate organization reporting to one or other of the Minister of Transport or DND, or some other Minister, which would set the requirements for and arrange with departments for the delivery of various elements of the SAR program, and control resources.

5.47 The Team also concludes the following with respect to the management process evaluation issues:

(1) Although statements of the responsibilities of the various departments involved in SAR, which were initially proposed to ICSAR by a TBS led study group in 1979 and more recently in SARCORE, are consistent and compatible, they do not have interdepartmental agreement nor have they been put to ministers. In addition they are not, in the context of the SAR program, complete since they do not cover all tasks necessary to execute the program. They are therefore inadequate to achieve SAR objectives.

(2) ICSAR authorities, responsibilities and accountabilities and the accountability of departmental ICSAR members are not clearly stated in relation to its Secretariat or to departmental SAR foci and other organizational elements of the departments concerned.

This, together with ICSAR's inability to resolve contentious issues between departments and the lack of complete definition of objectives and responsibilities for elements and tasks of the SAR program, has contributed to unsatisfactory progress in implementing improved SAR prevention measures, and in improving management information and the cost-effectiveness of the SAR program.

(3) In Parts III and IV of the Evaluation Report the Team has developed specific proposals to provide an answer to the evaluation question on how to improve the quality of SAR planning and programming and to enhance its effectiveness. The Team has developed a logical structure within which all planning, organizing, resourcing, delivering, controlling, co-ordinating, evaluating and performance measurement could be done in the future. It has introduced planning tools such as scenario analysis, a costing model and an operations research model for force posture analysis which should be further developed and made recommendations for implementation.

(4) The Team has carried out the following work to determine the needs for a comprehensive management information and further evaluation of SAR:

(a) identified relevant data currently available and analyzed it;

(b) provided the framework for SAR operations and prevention noted in (3) above;

(c) developed computer programs for SAR planning and analysis to enable SARSTATS to be machine rather than hand manipulated, as in the past;

(d) identified specific indicators and proposed additional indicators and standards for SAR operations in Part III of the report to provide guidance on additional data to be collected.

(e) provided recommendations concerning the organization for the co-ordination and development of SAR management and financial information system in the future.

Annex VI-1

SARCAN - A CENTRALIZED SAR ORGANIZATION

1) SARCAN will report through the Minister of ____________

2) SARCAN will be funded through a distinct SAR program.

3) SARCAN will be the sole SAR authority for both the air and marine environments.

4) SARCAN will consist of a small HQ staff and have under its direct control the four RCCs and the SARECs.

5) RCCs and SARECs may be lodged on DND or CCG bases but will not be responsible to the base, regional or command HQs of DND or CCG.

6) Command and Control of RCCs will depend on the proportion of distress incidents; i.e. Edmonton - Military CO, Victoria - CCG CO.

7) The personnel manning the RCCs and SARECs will be from DND and CCG on secondment for a period of four years (1 year for training and familiarization). Their PER will be signed by their respective DC and approved by SARCAN.

8) Selection criteria for these RCC positions will be laid down by SARCAN and will include:

   1) Military - pilots only
   2) CCG - Masters only
   3) Pilots must have served in a SAR SQDN
   4) Masters must have commanded a SAR vessel
   5) All must have gone through SAR course at TCTI
   6) Training requirements

9) SARCAN will own and control all dedicated SAR vehicles and equipment and obtain funding for replacement vehicles.

10) SARCAN will determine the P, O&M costs of operating the vehicles and allocate these funds and PYs to DND and CCG in normal 5 year plan.

    N.B. These funds and PYs are outside the Defence Services Program and Marine Program.

11) DND and CCG will second the personnel to operate and maintain the vehicles as per the approved 5 year plan subject to criteria laid down by SARCAN. Personnel will have minimum 4 year tour of which 1 year will be training and familiarization.

12) Operational Equipment Requirements (OER) will be developed by the DCs and their support staff in consultation with DND/Air and CCG/Fleet Systems staffs.

13) SAR SQNS and CCG SAR vessels can be lodger units at DND or CCG bases but not under command of the respective base commanders.

14) Any controller may task dedicated SAR sources whether air or marine including auxiliaries.

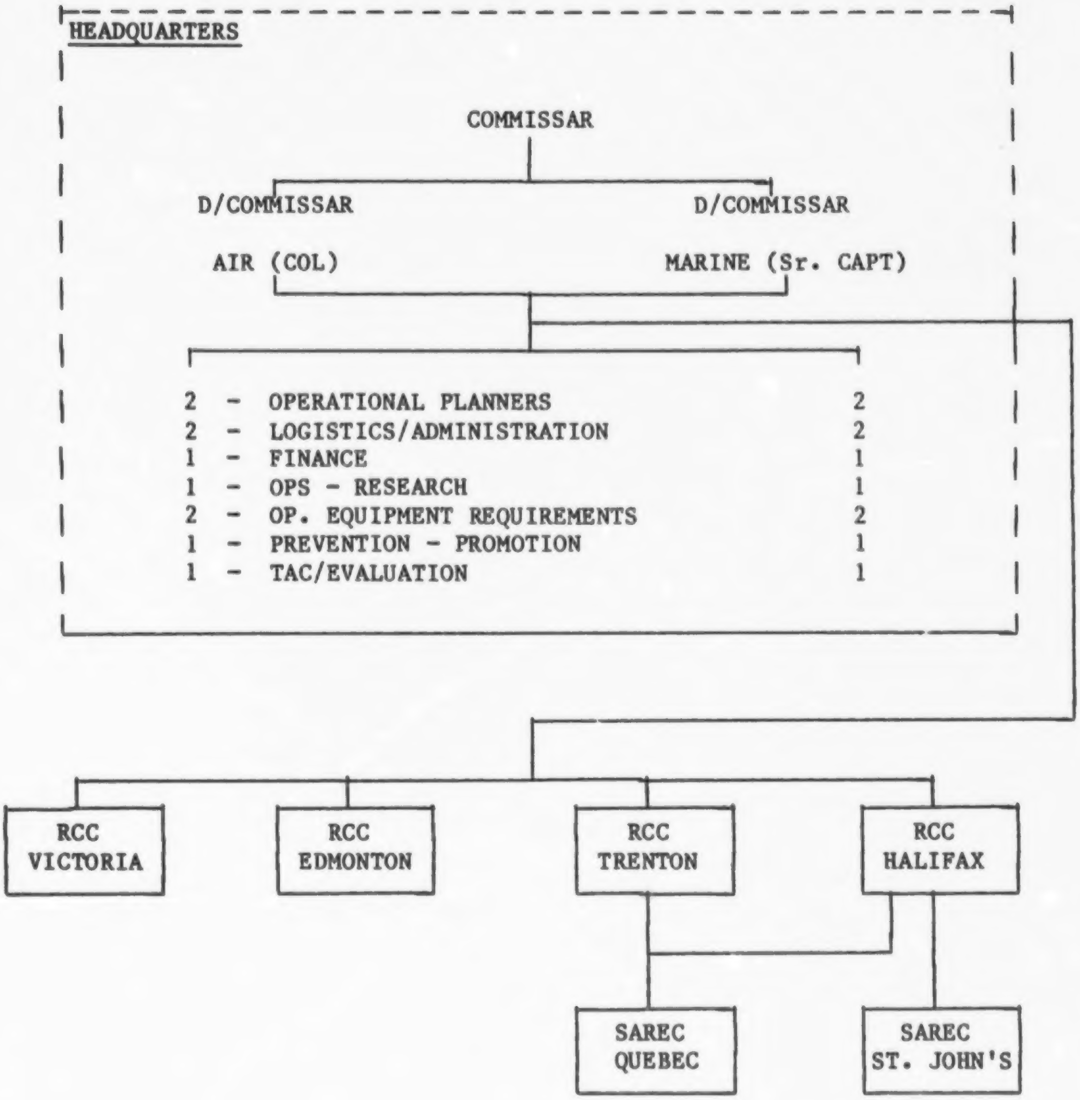
15) SARCAN will set down the operational standards for the squadrons and vessels.

16) SARCAN will exercise and test the RCCs, SARECs, squadrons and vessels at least once per year.

17) SARCAN will be the sole contact point for all SAR related matters.

ANNEX VI-1

SARCAN


HEADQUARTERS
COMMISSAR
D/COMMISSAR
AIR (COL)
D/COMMISSAR
MARINE (Sr. CAPT)
2 - OPERATIONAL PLANNERS 2
2 - LOGISTICS/ADMINISTRATION 2
1 - FINANCE 1
1 - OPS - RESEARCH 1
2 - OP. EQUIPMENT REQUIREMENTS 2
1 - PREVENTION - PROMOTION 1
1 - TAC/EVALUATION 1
RCC VICTORIA
RCC EDMONTON
RCC TRENTON
RCC HALIFAX
SAREC QUEBEC
SAREC ST. JOHN'S

ANNEX VI-1

SARCAN

A - DOES
B - IMPLEMENTS & PROVIDES ADVICE
C - PARTICIPATES
D - KNOWLEDGEABLE ABOUT

	SARCAN	DND	CCG	DFO
1. POLICY DEVELOPMENT				
DEVELOPMENT & ADVICE	A	D	D	D
INTERNATIONAL RELATIONS	A	-	-	-
SUBMISSIONS TO HIGHER AUTHORITY	A	C	C	C
ENQUIRIES	A	-	-	-
INTERDEPARTMENTAL	A	B	B	B
2. PLANNING AND PROGRAMMING				
RESEARCH & DEVELOPMENT	A	C	C	C
OPERATIONAL RESOURCE REQUIREMENTS	A	B	B	B
PROGRAM PLANNING	A	C	C	C
PROGRAM PROPOSALS	A	C	C	C
RESOURCE ALLOCATION	A	C	C	C
3. OPERATIONS				
DIRECTS	A	B	B	B
EVALUATES	A	C	C	C
COMMUNICATES	A	B	B	B
4. PERSONNEL				
REQUIREMENTS	A	B	B	B
CAREERS	C	A	A	A
5. FINANCE AND ADMINISTRATION				
FINANCIAL APPROVALS	A	B	B	B
FINANCIAL DISBURSEMENTS	A	B	B	B
GRANTS & CONTRIBUTIONS	A	D	D	D
ADMINISTRATION	A	D	D	D

ANNEX VI-2

Concept SAR 1990

Background

As a result of the evaluation of the existing National SAR Program, the Team has developed several viewpoints as to how the Program might be provided to Canadians. A balance sheet of the strong and weak points of the present system, the findings of the Team and the application of the principle of not creating significant incremental increased costs suggest a feasible scenario. The purpose of this scenario, "Concept SAR 1990", is to provide one solution to the problem of how to deliver the National SAR Program. Its title suggests that the present SAR system might evolve in the Concept's direction within the next decade. The reader is cautioned to consider this approach as a useful solution which is valid within the scope of the Team's year-long studies, but not the only one that could be developed.

Aim

The aim of "SAR 1990" is to present a concept which provides a basis for how a federal government SAR Program could be delivered in Canada within the realities of the present era.

Factors

"SAR 1990" is designed with several factors or underlying assumptions with respect to the needs of the SAR Program. These are:

(a) The SAR Program requires a single program manager.

(b) An overall, interdepartmental planning, programming, budgeting and information control system is needed.

(c) The control and co-ordination of SAR operations requires redirection to serve the incident demands which are preponderantly marine.

(d) Marine SAR operations require more control and co-ordination by mariners.

(e) A comprehensive organizational structure is needed to assign responsibilities for and execute prevention activities.

(f) Unified SAR training of air and marine mission response co-ordinators and controllers is necessary.

(g) Air and marine volunteers need to be more thoroughly integrated into the SAR operations system.

(h) Because SAR is a government service, the air and marine publics and government departments need a formalized means of fostering dialogue and communications to understand SAR standards, goals, objectives, issues, public perceptions and needs to resolve real or perceived problems.

The Structure

A proposed structure for a Canadian National Search and Rescue Agency (CANSAR) is illustrated in Figures 9-1 and 9-2. It is conceptual in nature and does not aspire to resolve every difficulty.

The Program manager is titled the Commissioner of Search and Rescue and he reports to or through a minister. His responsibility is to ensure that all aspects of the SAR Program are accomplished in an organized and optimized way. He is advised by ICSAR concerning the Program. He has a staff secretariat which performs specific program activities on his behalf. This Commissioner has final authorization over budget resources of funds allocated to SAR before the SAR Plan goes through Treasury Board and/or expenditure envelope approval.

The Commissioner contracts with departments to deliver specific SAR services. These are grouped into Operations and Prevention activity categories plus the addition of joint training. The contracts would specify the nature of the services required against objectives, numerical standards and goals within specific budgeting resource limits. The remainder of Figure 9-1 is generally self-explanatory. For DND and CCG, the methods of providing SAR response resources do not change significantly except for the restructured RCC's. Prevention activities now have a responsibility centre within CATA and CCG executes them through Ships Safety.

The current structure of search and rescue regions is revamped, primarily to correspond with CCG Regions. A need for an Inland SAR Region becomes apparent because of the present CCG structure which has little SAR activity across the Prairies. Figure 9-2 sketches an approach to SAR Regions, but makes no attempt to define the boundaries.

SAR Co-ordination is performed by a designated Co-ordinator who ensures that all SAR services have been assigned within a geographical area. He also co-ordinates SAR planning and Regional SAR Advisory Councils. It is likely that in most Regions this role would be assigned to the CCG Regional Manager for SAR. Executive responsibility for performing each SAR concern still rests with the line departments with which the service has been contracted.

SAR Advisory Councils are needed to foster dialogue and communication among all participants. The kinds and needs of members are different in each area of the country, therefore a regional structure is necessary. The SAR Councils would also have an input to the SAR Plan.

Advantages and Disadvantages

This Concept offers a means to a solution of the current SAR Program difficulties. This brief presentation will not present a litany of advantages and disadvantages of the structure. It is sufficient to say that advantages should outweigh the disadvantages and the Concept provides a way to integrate all aspects of the SAR Program.

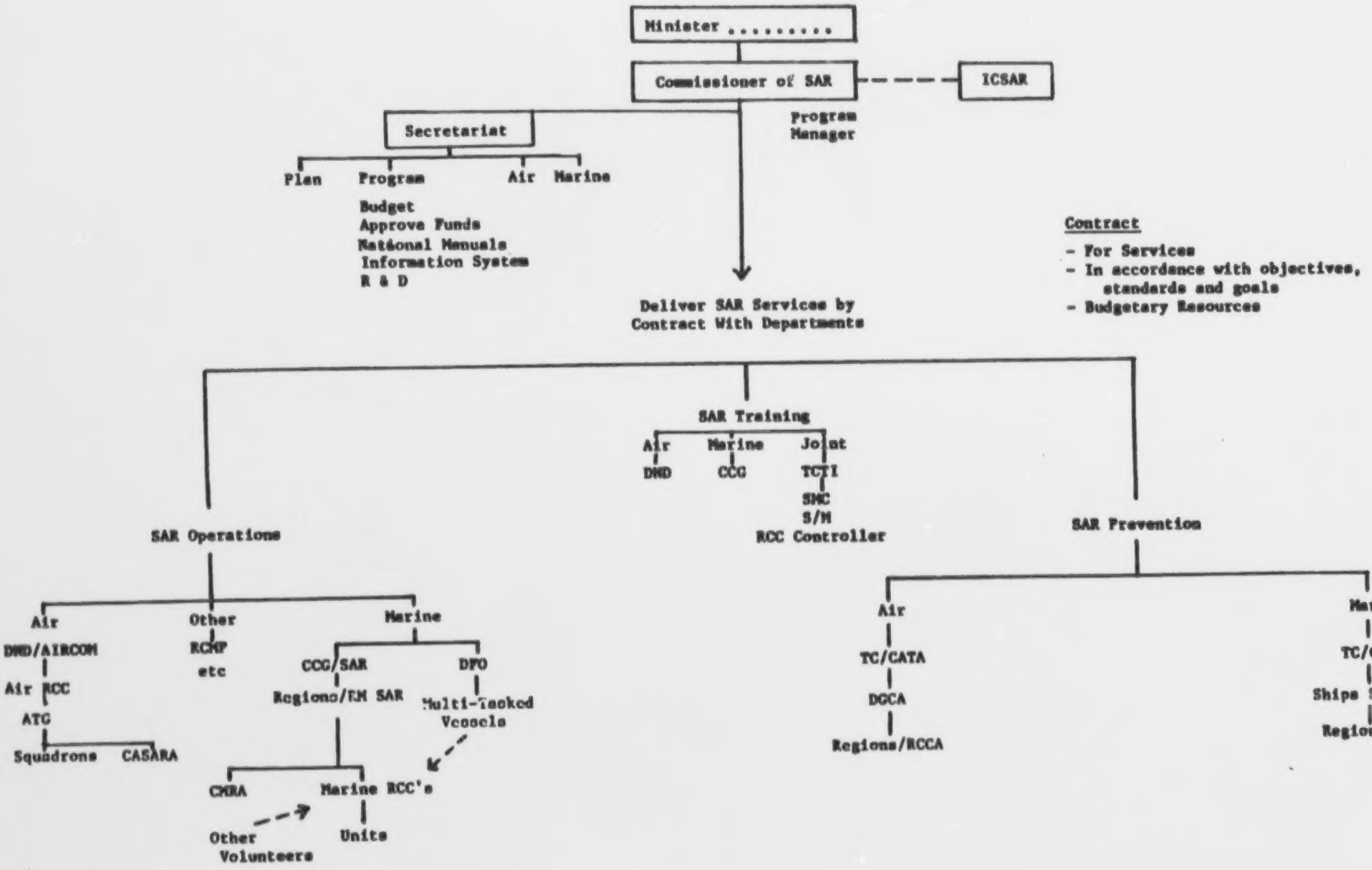
Implementation

Should a revised SAR organization such as this be considered warranted, it should be implemented following an appropriately implemented Task Force's study. Concept "SAR 1990" is offered as an initial approach to an integrated SAR service in Canada.

FIGURE 2-1

CONCEPT "SAR 1990"

CANADIAN NATIONAL SEARCH AND RESCUE AGENCY (CANSAR)


Minister ....
Commissioner of SAR
ICSAR
Program Manager
Secretariat
Plan
Program
Air
Marine
Budget
Approve Funds
National Manuals
Information System
R & D
Deliver SAR Services by Contract With Departments
SAR Operations
Air
DND/AIRCOM
Air RCC
ATG
Squadrons
CASARA
Other
RCMP
etc
Marine
CCG/SAR
Regions/FM SAR
DFO
Multi-Tasked Vessels
CMRA
Marine RCC's
Units
Other Volunteers
SAR Training
Air
DND
Marine
CCG
Joint
TCTI
SMC
S/M
RCC Controller
SAR Prevention
Air
TC/CATA
DGCA
Regions/RCCA
Marine
TC/CCG
Ships Safety
Regions/SS

Contract

- For Services
- In accordance with objectives, standards and goals
- Budgetary Resources

ANNEX VI-2

FIGURE 2-2
"SAR 1990" OTHER FEATURES

SAR REGIONS

Air

- National and ICAO FIRS/Inland Region,
- Where regional needs for air concerns exists - parallel the CCG regions,
- RCC - Winnipeg.

Marine

- Designate initially relative to the 5 CCG regions,
- Inland Region between Great Lakes and Rockies needed,
- RCC's: Vancouver/Toronto/Quebec City/Halifax/St. John's
- SARECS: Victoria/Sarnia/Prescott/Montreal

REGIONAL CO-ORDINATOR

- Ensures that all SAR responsibilities and activities are assigned and executed for the region.
- Contingency plans for major PAX carrier SAR distress
- Co-ordinates - SAR Planning
  - Regional SAR Council

SAR ADVISORY COUNCILS

National

Members - Chairman - Commissioner
- Departments
- National Marine & Air Public Representatives
- Delegates from Volunteer Groups

Regional

Members - Chairman, Regional Co-ordinator
- Regional Departmental Representatives
- Provincial Air and Marine Departments
- Police - Provincial & Municipal
- Representatives of Regional Air & Marine Publics
  - Volunteer
  - Aviation Councils

ANNEX VI-3

Extracts from "A Report on the Marine SAR Program in the Victoria Search and Rescue Region" - August 1981, Prepared by DND/CCG Interdepartmental Review Team

page 58 (e) . . . . . Volunteer assistance in the Nanaimo area has been strong and these volunteers have already expressed concern that the establishment of a primary unit will undermine the requirement for this service.

(f) The concept of augmenting core CG crews of SAR cutters with volunteers as in the case of the RELITE was seen as a highly cost-effective method of operating a primary SAR resource . . . . . This concept has the potential for efficient crewing of other small cutters (class 400 or smaller) provided volunteers are available. In areas where dual resources are considered and volunteer support is strong, the concept of assigning the smaller resource to volunteer units should also be evaluated.

page 67 105. The volunteer spirit in the Victoria SRR was extremely high amongst members of representative groups interviewed. . . . . there was considerable dissatisfaction expressed by volunteers in a number of areas.

106. Despite the high number of volunteers in the various organizations there was considerable dissatisfaction expressed by many that they are seldom used in SAR operations . . . . . Additionally in some areas the high response to incidents by volunteer organizations has resulted in requests and approvals for primary SAR units to be established to cover a perceived need for additional SAR resources. The approval and implementation of these resources in turn erodes the volunteer spirit that previously existed. Once a primary SAR unit has been established the RCC tends to use the primary unit to resolve most incidents in that particular area. Frequently the displaced volunteer expresses his frustration through criticism of the primary units' performance and the SAR program in general.

107. . . . . The apparent lack of flexibility by the federal government to effectively unite and utilize the services of these volunteers has resulted in a number of independent but competitive organizations all working toward similar objectives through a number of different administrative and operational guidelines.

109. During the course of the review the team had the opportunity to evaluate the effectiveness of the RELITE operation in Campbell River. The RELITE is a 41' primary SAR vessel that is operated by a CCG Coxswain and crewed by members of the CMRA. During summer

periods the volunteers are supplemented by summer students to ensure an adequate core of crew is available. During 1979 and 1980 this unit responded to 474 marine SAR incidents. Although the vessel is not ideally suited to SAR operations in its area, it is noteworthy that the crew of this vessel responded to incidents within an average of 15 minutes and the personnel at the RCC had the utmost praise for the vessels response to incidents.

110. The concept of utilizing volunteers to augment a basic complement of CCG personnel in primary SAR vessels has potential for a highly cost-effective and efficient SAR operation in areas where volunteers are willing to support such an arrangement. Combined crewing unifies the Canadian Cost Guard and volunteers in support of similar objectives and creates a feeling of mutual respect and team work. It also results in the local community having considerable respect, support, and pride in the operation of "their" vessel.

Recommendations

page 69 (a) RCC Victoria should evaluate its tasking policy on marine incidents to allow where possible, for a greater degree of volunteer participation in resolving marine SAR incidents.

(c) The practice of utilizing volunteers to supplement areas of primary SAR vessels should be evaluated in other areas where volunteer participation is strong. The possibility of continuing the concept for the RELITE replacement should be evaluated and implemented if such evaluation proves favourable.

(d) A dedicated effort should be made to recruit suitable fishing vessels and fishermen into the CMRA, particularly in remote areas where there is little primary SAR coverage.

(e) RCC Victoria should evaluate the feasibility of employing CMRA volunteers to assist in the coordination of volunteer activity.

Suitability of Primary Marine Resources

page 56 92. . . . . From the detailed analysis of the nature and seriousness of incidents in areas 304 - 307 inclusive, it is evident that some fine tuning of existing and future marine resources may be required in the following areas:

(a) Single Base/Dual Resource Concept

As noted in the analysis of marine SAR incidents, a number of minor SAR incidents are being recorded in close proximity to shore-based primary marine SAR resources. As a result a major unit is being used to resolve a number of minor incidents when a more cost-effective solution might be to base a small high speed resource at the same base as the major unit. This concept of operation would not involve additional PY's and only minimal resources as the existing crew would be able to select the most appropriate resource to resolve the particular incident. It is expected that if this concept proved effective it could be used at various locations along the coast such as Prince Rupert, Bella Bella and Campbell River.

Multitasking

page 59 93. The multitasking of marine resources to improve SAR response capabilities is a particularly cost-effective method of improving coverage, especially where there is a relatively low level of SAR activity. It is observed that there are a considerable number of resources operated by other government departments which are not involved in the provision of marine resources to the SAR program . . . . . The possibility of multitasking federal vessels other than DFO to the SAR program has not been carried out as part of the SAR planning process.

94. . . . . multitasking of the Arrow Post at Queen Charlotte City should be extended and the requirement of a class 400 vessel at this location should be deleted. The requirement for a primary class 400 vessel at Masset should be re-evaluated in consideration of . . . . . (the) DFO plan to replace the present vessel at Masset with a more capable resource.

Recommendations

page 61 97 (h) . . . . . proposals to replace multi-tasked coverage with primary unit coverage be supported by greater justification including reasons why the multitasked unit is no longer cost-effective . . . . .

(i) The need for Class 400 SAR vessels at Queen Charlotte City and Masset be re-evaluated in consideration of cost-effective multi-tasking arrangements, the availability of the Class 600 vessel, and the relatively low level of SAR activity in these particular areas.

PART VII - SYNTHESIS OF OBSEVATIONS CONCLUSIONS AND RECOMMENDATIONS

Aim

1.1 The purpose of Part VII of the report is to develop a synthesis of observations and conclusions which provide the basis for, and to set out, the Team's recommendations.

Approach

1.2 As the Team's appreciation of how best to achieve an effective SAR program developed, it became apparent that its recommendations would be based on a synthesis of observations and conclusions drawn from throughout the various parts of the report.

1.3 The synthesis which follows provides a summary of the principal relationships between observations and conclusions which lead to the Team's recommendations. In some cases the observations and conclusions listed are paraphrases of the main text, in order to save space.

Use

1.4 The observations and conclusions have all been identified by Report part and paragraph numbers, so that readers can refer to the evidence and associated discussion, observations and conclusions in appropriate sections of the report.

1.5 The listings of observations and conclusions are organized according to identified issues and provide a means whereby readers can refer forward to the Team's recommendations.

1.6 The final section provides a list of the Team's recommendations for SAR management, operations, prevention and programs impinging on SAR.

SAR OPERATIONS

ISSUE	OBSERVATIONS	CONCLUSIONS
1. NEED FOR PRIORITIES TO IMPROVE SAR PROGRAM OPERATIONS RESPONSE	. (III/2.9/d) Emergency beacons could be made more useful and less a source of false alarms by: (1) mandatory installation in all aircraft as soon as possible (2) reducing false alarms through better designed beacons, and user education for operators and technicians, (3) mandatory installation of EPIRBs on specific classes of inshore and all off-shore vessels; . (III/2.8/a) Visual methods of alerting have proven significant to vessels. This fact should support regulations on the carrying of visual attention getting signal devices. . (III/2.22/e) Decision and reaction times are generally greater than transit times. This indicator added to the length of notification time demonstrates that it takes longer to learn about, verify and launch a response, in general, than it does to execute the flight to the area of the incident. . (III/2.22/f) Searches consume the majority of the aircraft hours spent in responding to a distress. Methods of shortening search time offer the most fruitful way of saving air search resources. . (III/2.50/c) The need for a thirty minute standby versus a two hour standby is doubtful at present for the purely air response role. This conclusion will change with the implementation of a successful ELT/SARSAT system of distress alerting and location. . (III/2.50/i) Research and development for applying new technology to SAR requirements is neither definite nor structured.	. (III/6.1/b) Electronic locator beacons used in the air mode reduce alerting and response time but also create a large number of false alarms. Failure to transmit on impact is common and indicates a need to improve their reliability and design. Further, there is little research and development in Canada into the use of alternate visual or electronic distress signalling aids. Thus, improved notification, detection and location technology which could substantially improve the performance of the SAR system is not being fully exploited.

ISSUE	OBSERVATIONS	CONCLUSIONS
1. NEED FOR PRIORITIES TO IMPROVE SAR PROGRAM OPERATIONS RESPONSE (CON'T)	. (III/1.21/e) Studies should also be made of the possible saturation of the SAR locator frequency and of other visual signalling methods such as inflatable balloons. . (c) The marine public must be encouraged to help themselves extend their survival time with adequate flotation gear that offers thermal protection. They also should carry a means of alerting the SAR system quickly and assisting an aiding vessel to locate them expeditiously. . (d) Federal SAR or marine safety organizations should sponsor correlated studies of flotation aids and thermal protection methods which would result in standards and regulations suited to the Canadian problem.	
	. (III/2.9/m) The marine public is generally unfamiliar with the need for speed in notifying RCCs/SARECs of a SAR problem nor does it know how to use the emergency radio network.	. (III/6.1/d) Stricter radio discipline is necessary in the marine mode. A guard mode on marine radio distress channels would enable more reliable and faster distress alerting.
	. (III/2.8/b) For the marine world, the radio is a major asset in notifying the SAR system of the need for help. This should lead to the encouragement of installing radios on boats whenever possible when they travel out of signt of marina or harbour. It also suggests the use of dedicated emergency channels on VHF/FM and CB radio stations, commercial vessels and possibly also the development of automatic triggering devices for emergency frequency on listening stations.	

ISSUE	OBSERVATIONS	CONCLUSIONS
1. NEED FOR PRIORITIES TO IMPROVE SAR PROGRAM OPERATIONS RESPONSE (CON'T)	. (III/2.66) (a) RCC facilities are out-dated, cluttered and create a poor impression of efficiency for the occupants as well as the public. . (b) state-of-the-art information access and display systems are lacking; . (c) analysis and planning of efficient work methods have not been applied; . (d) CCG SARECs are better organized and equipped than RCCs to execute their role; . (e) the organization and structure of RCCs, with their relative emphasis on air operations control, standardization and staffing, are inconsistent with the fact that demands on them are largely marine in nature. . (III/2.75/f) Departments usually train marine search mission co-ordinators and searchmasters separately although individuals from either DND or CCG may control or co-ordinate marine searches at RCCs. . (III/2.75/g) RCC controllers are insufficiently trained to begin their duties, particularly when air operations officers may be required by circumstances to co-ordinate marine SAR response.	. (III/6/n) RCC effectiveness should be improved by the acquisition of new equipment, refurbishment of facilities and staffing them with SAR trained personnel experienced in the SAR response area. Further, RCC organization and structure should be altered to reflect the mainly marine incident workload where this is the case.
	. (III/2.26/a) These times substantiate the use of vessels of opportunity as the best means of achieving the SAR objective of saving lives. The data also highlight the value for all vessels in transit of using either position reporting procedures or having transponders in radar environments to reduce the decision times. . (III/2.9/j) Many DFO vessels and CCG vessels cannot home on EPIRBs because they do not have the necessary VHF/DF homers for the 121.5 MHz distress frequency.	. (III/6.1/e) Improved information on vessel positions could enable better use to be made of the excellent response capability of vessels of oppostunity. . (III/6.1/g) The provision of SAR equipment in all suitable government aircraft and vessels would enhance their ability to locate and to provide a response to vehicles declaring distress. . (III/6.1/i) Multi-tasking of DFO vessels, although creating an increased number of responses to incidents, provides a valuable

ISSUE	OBSERVATIONS	CONCLUSIONS
1. NEED FOR PRIORITIES TO IMPROVE SAR PROGRAM OPERATIONS RESPONSE (CON'T)	. (VI/3.76/4) Government vehicles suitable for SAR response as vehicles of opportunity do not all have the necessary equipment.	additional resource for the SAR program. . (VI/3.77) A substantially improved SAR capability for government fleets as vehicles of opportunity could be obtained for modest expenditure.
	. (III/2.50/v/8) Duplication by the USA and Canada of expensive resources in certain areas should be examined for the possibility of one or other organization handling a particular geographic area. . (II/1.30/c) There are many provincial and private organizations with an interest in and capabilities for search and rescue. This role is not specifically recognized in the National SAR Plan, nor does the option of encouraging their expansion seem to have been seriously considered.	. (II/6.1/b) Greater use of provincial resources and greater reliance on volunteer organizations and the commercial private sector are feasible options both for the conduct of SAR operations and in SAR prevention. A resourcing philosophy based on such an approach would be consistent with IMCO and ICAO agreements and, as the Team's analysis in other parts of this report shows, could lead to a more effective SAR program. . (III/6.1/h) The use of volunteers to man a lifeboat appears to have been succesful. Extensive use of full or partial volunteer crews should be introduced to limit the cost of operations of CCG vehicles and to improve SAR response.
	. (II/1.30/d) The volunteer spirit is still strong in Canada, particularly in the western provinces and there is provincial support for organizations which play a role in SAR. . (III/2.50/v/10) Greater use should be made of volunteers to crew vessels to assist the CCG coxswain. The replacement for the RELITE in Victoria SRR should continue to use volunteers as crew. . (III/2.50/r) The use of volunteers to man or partially man lifeboats was advocated by those interested parties interviewed. . (III/4.30/a) The most effective SAR marine response at the lowest cost, as measured against the goal of having a	

ISSUE	OBSERVATIONS	CONCLUSIONS
1. NEED FOR PRIORITIES TO IMPROVE SAR PROGRAM OPERATIONS RESPONSE (CON'T)	SAR system respond within a fifty mile radius of a SAR base, is to make the most possible use of volunteers and to use CCG lifeboats and cutters with an increased performance over the present inventory. Scenario I resourcing provides the details. . (III/2.50/v/1) The use of primary resources appears to take priority over the use of other response means such as CMRA or vessels of opportunity.	
	. (III/2.50/vii) Multi-tasking of DFO vessels has proven useful and cost effective. . (III/2.50/t) Multi-tasking of DFO vessels has declined as new SAR vessels have come into service. . (III/2.50/vi) The use of primary resources appears to take priority over the use of other response means such as CMRA or vessels of opportunity.	. (II/6.1/k) Primary federal SAR resources rescue or assist in the majority of incidents. Also the positioning or repositioning of federal SAR vehicles causes significant increases in the number of incidents of all types recorded or responded to. Thus, new federal vessels displace previously provided self-help, or vessels or opportunity. This being the case, particular care must be taken in deciding when the type and number of incidents justify displacement of multi-tasked vehicles, vehicles of other jurisdictions, or volunteers, or in areas of high vessel traffic where the probability of assistance from vessels of opportunity is high. . (III/6.1/i) Multi-tasking of DFO vessels, although creating an increased number of responses to incidents, provides a valuable additional resource to the SAR program.
	. (VI/3.76) There are differences in DFO and CCG perceptions as to need for, and desirability of multi-tasking arising out of lack of agreement on what costs should be attributed to SAR and CCG's view of the risks which can be borne in making plans to fill	. (VI/3.77/1) Full use is not being made of DFO's fleet to provide SAR coverage nor is the present approach to multi-tasking and to ship capital acquisition planning optimum, when viewed from an overall viewpoint of total costs

ISSUE	OBSERVATIONS	CONCLUSIONS
1. NEED FOR PRIORITIES TO IMPROVE SAR PROGRAM OPERATIONS RESPONSE (CON'T)	perceived gaps in coverage when the location of DFO ships is uncertain in the planning horizon.	and benefits to the combined SAR fisheries patrol and fisheries research programs. . (2) This results from concerns in both departments which must be addressed if full advantage is to be derived from multi-tasking. . (3) A set of guidelines covering accounting principles and allowable costs, including attributable overheads for multi-tasking, is required. . (4) An analysis is required, in the context of the DFO fisheries and research programs and the SAR program, of the extent to which the operations of DFO vessels with a SAR capability could be extended to 24 hours, 7 days per week during their maximum available response days, including: - costs involved. - benefits to SAR program - benefits to fisheries patrol and research program - possible offsets from new SAR vessel acquisition - possible offsets from new fisheries vessel acquisition . (5) If the benefits and offsets justify the extension, the necessary funding could best be justified and obtained through the DFO estimates.
2. NO SPECIFIED STANDARDS AND GOALS	. (III/2.50/v/8) Duplication by the USA and Canada of expensive resources in certain areas should be examined for the possibility of one or other organization handling a particular geographic area. . (II/1.30/c) There are many provincial and private organizations with an interest in and capabilities for search and rescue. This role is not specifically recognized in the	. (III/6.1/l) There is a need for a clearly identified federal SAR program accompanied by a set of policies, levels of service and standards and procedures against which to measure program performance. . (III/6.1/m) The Scenario analysis carried out by the Team confirms that such an analysis can be useful for improving force

ISSUE	OBSERVATIONS	CONCLUSIONS
2. NO SPECIFIED STANDARDS AND GOALS (CON'T)	National SAR Plan, nor does the option of encouraging their expansion seem to have been seriously considered. . (II/1.30/d) The volunteer spirit is still strong in Canada, particularly in the Western provinces and there is provincial support for organizations which play a role in SAR. . (III/2.50/v10) Greater use should be made of volunteers to crew vessels to assist the CCG coxswain. The replacement for the RELITE in Victoria SRR should continue to use volunteers as crew. . (III/2.50/r) The use of volunteers to man or partially man lifeboats was advocated by those interested parties interviewed. . (III/2.50/e) Halifax Region requires fixed and rotary wing response aircraft with greater speed, endurance and range than those currently in use. . (III/2.50/f) All the present fixed and rotary wing SAR aircraft lack some characteristics of an ideal SAR aircraft. Specific comment is provided in this section. The next generation of SAR aircraft should be modified for their role so that they match more closely the requirements DND has defined for SAR air operations. . (III/2.50/p) The capabilities and design of some SAR vessels has been questioned. . (III/2.50/v3) The design of the 22 metre cutters is the subject of much disagreement in the CCG. . (III/2.50/v9) The use of high speed rigid hull inflatables for the Great Lakes/Upper St. Lawrence area should be investigated. . (III/2.50/v5) Crews would prefer higher speed vessels of the 300/400 class to minimize pounding in heavy weather. . (III/2.50/v6) 301, 302, 303, 304 marine sub-areas require high speed small vessel response.	postures in the context of such standards and that there are better coverage, faster response and lower cost scenarios than the proposed 1982/83 SAR Plan. . (III/6.1/f) The federal marine air response capability is well trained and equipped. However, the effectiveness of some existing SAR vehicles for SAR role has been questioned. . (II/6.1/n) There are no policies on levels of service, standards or goals against which to measure performance. Thus only qualitative judgments on the performance of the SAR response system is possible. . (III/6.1/f) The federal marine and air response capability is well trained and equipped. However, the effectiveness of some existing SAR vehicles for their SAR role has be questioned.

ISSUE	OBSERVATIONS	CONCLUSIONS
2. NO SPECIFIED STANDARDS AND GOALS (CON'T)	• (III/2.50/d) The primary SAR role requires a unique expertise with specially equipped, capable aircraft and efficient crews trained for their roles. • (III/4.30/a) The most effective SAR marine response at the lowest cost, as measured against the goal of having a SAR system respond within a fifty mile radius of a SAR base, is to make the most possible use of volunteers and to use CCG lifeboats and cutters with an increased performance over the present inventory. Scenario I resourcing provides the details.	
	• (III/1.15/e) Survivors should be equipped with appropriate clothing, food for several days and some major first aid equipment. • (III/1.21/a) Elapsed time is the major problem of survival in the water and requires first, flotation gear and secondly protection from hypothermia. • (III/1.21/b) Survival time for unprotected persons in water is relatively short, 15 mins to one hour, during about nine months of the year. • (III/1.21/c) The marine public must be encouraged to help themselves extend their survival time with adequate flotation gear that offers thermal protection. They also should carry some means of alerting the SAR system quickly and assisting an aiding vessel to locate them expeditiously. • (III/1.21/d) Federal SAR or marine safety organizations should sponsor correlated studies of flotation aids and thermal protection methods which would result in standards and regulations suited to the Canadian problem. • (III/2.50/o) The public is unable to determine the emergency equipment needed to ensure survival. • (III/3.14/c) Goals and standards would show the public the exact degree of	• (III/6.1/a) Survivability in both the air and marine environments is dependent on time, clothing and season. The public would know better how best to protect itself, and would have a better understanding of the extent to which they must be responsible for their own survival if levels of service were published.

ISSUE	OBSERVATIONS	CONCLUSIONS
2. NO SPECIFIED STANDARDS AND GOALS (CON'T)	self-help necessary for their own survival within the SAR system's rescue capabilities.	
3. MAJOR MARITIME DISASTER CONTINGENCY PLANS LACKING	. (III/2.50/w) Contingency plans for rescue operations following accidents to major passenger carrying aircraft or vessels are necessary as part of the SAR organization's responsibilities. These are not prepared or available for disasters occurring in the maritime environment.	. (III/6.1/1) There is a need for contingency plans to provide timely and co-ordinated response to maritime disasters occurring on the high seas.
4. LACK OF POLICIES FOR USE OF SAR RESOURCES FOR NON-DISTRESS	. (III/2.50/v/13) There is no national policy on towing a vessel whether in distress or not. Unfortunately, the SARSTATS do not indicate the number of tows and the mileage towed over the five year period under review. In 1980, tows occurred in 7% of the Category 3A incidents. . (14) There is no national policy on the provision of fuel to a vessel whether in distress or not. In some cases, it is provided free, in others there is a charge. In approx. 2% of all Category 3A incidents fuel was provided. . (15) When either a tow or fuel is provided free, it appears to encourage a mariner in the unseamanlike habit of deliberately staying at sea longer or venturing farther than his fuel will allow. . (III/2.92/b) There is no official government policy on the towing of vessels or the supply of emergency fuel. . (III/1.34/d) The first measure of SAR program, the "incident" requires re-definition into major and minor classifications.	. (III/6.1/k) There is a need for government policies for the towing of vessels, for supplying fuel and mechanical assistance, and for cost recovery in this respect.

ISSUE	OBSERVATIONS	CONCLUSIONS
4. LACK OF POLICIES FOR USE OF SAR RESOURCES FOR NON-DISTRESS (CON'T)	• (II/4.7/g) The employment of aircraft for humanitarian purposes in Halifax in recent years outstrips the other regions both proportionately and absolutely. • (II/4.7/k) Vessel hours responding to humanitarian and civil incidents have increased steadily over the six years driven mainly by response to humanitarian distress events.	
	• (VI/5.17) The current marine "free towing services" do not discourage unseamanlike behaviour. The U.S. Coast Guard is proposing to introduce cost-recovery measures. Many persons interviewed were of the view that cost-recovery should be introduced and that associated policies should encourage the establishment of private sector services.	• (VI/5.18) Policies should be established for the use of SAR resources in non-distress • Previous ministerial requests for cost-recovery policies should be responded to. • Policies should encourage the establishment of such services in the private sector.
5. SAR VESSELS NOT EASILY IDENTIFIABLE	• (III/2.92/e) There is a need for the SAR clientele to identify those vehicles which are dedicated to SAR. • (III/2.50/d) The primary SAR role requires a unique expertise with specially equipped, capable aircraft and efficient crews trained for their roles. • (III/2.50/m) Public and political pressure play a large part in the provision and location of SAR services.	• (III/6.1/o) There is a need for special identification of vehicles which are dedicated to search and rescue so that the public at large can readily recognize them.

SAR PREVENTION

ISSUE	OBSERVATIONS	CONCLUSIONS
1. NO REGIONAL OR NATIONAL SAR PREVENTION FOCUS	• (IV/2.53/1) There are many organizations in Canada involved in aviation and marine safety, ranging from the federal government to the insurance industry. No evidence could be found than any one of these organizations was explicitly involved in SAR prevention. This suggests that some means of raising the SAR prevention consciousness of these organizations should be found and that appropriate national and regional co-ordinating mechanisms should be established possibly along the lines of the Marine Safety Advisory Council.	• (IV/2.54/a) Encouraging co-ordination of private organization involvement in federal SAR prevention efforts could result in a more effective national program as well as contributing to increased public consciousness of SAR prevention and operations objectives. Such co-ordination and involvement could be achieved through a national and regional SAR advisory councils.
2. SAFETY AND SAR PREVENTION PRIORITIES DIFFER	• (IV/2.9) It is clear from departmental objectives statements that there is a direct linkage and in certain instances an overlap, between the activities of SAR prevention and those of existing aviation and marine safety programs. In fact, departments assigned safety program responsibilities do perform investigating, regulating, enforcing and promoting/educating as well as external navigation assistance activities necessary to ensure the conduct of safe flight and voyages. The primary focus of these safety programs is to prevent accidents and incidents which endanger the safety of persons. By definition, they are not directed primarily at preventing search operations caused by false alarms and other occurrences where the safety of persons was not at stake.	• (IV/2.54/b) Priorities and measures to ensure safety are set in the context of overall safety objectives. The mix of measures and emphasis required to minimize SAR incidents can differ from that required to minimize air and marine accidents. Thus SAR priorities to improve aviation and marine safety may also be quite different.

ISSUE	OBSERVATIONS	CONCLUSIONS
2. SAFETY AND SAR PREVENTION PRIORITIES DIFFER	. (IV/2.53/2) It is clear from the role and objectives of ICAO, IMCO and DOT that the efforts of these organizations are directed primarily at achieving safe and efficient movement of international and national commercial transportation, rather than focusing on the safety and SAR prevention needs of other aviation and marine clients such as recreational flyers and boaters. . (IV/2.13) The mix of measures required to prevent accidents and incidents that result in a SAR distress incident may be different from the mix required to deter the generation of other types of SAR incidents. Therefore, the desirable mix from a SAR viewpoint can be quite different from the present mix of safety measures. Accordingly, from the SAR viewpoint, priorities for improvement of safety programs may well be different from priorities currently assigned to improving safety measures in toto.	
	. (IV/7.4/b/1) For aviation and marine SAR prevention levels of service, Table 7-1 depicts the Team's perception of federal government SAR organizational tasks and goals or standards with applicable sources or means of delivering required prevention services. . (VI/3.47/1) CATA has developed and implemented neither strategic nor program objectives for its SAR operations or prevention activities. This may not be surprising since CATA does not appear to have accepted that it has SAR objectives. . (VI/3.47/2) No integrated long-term planning or program planning in relation to SAR operations or prevention is underway.	. (IV/2.54/c) The Team is of the view that it would not be economical to establish SAR prevention programs separately from existing safety programs. Thus, there is a need to consider how safety programs may be influenced, whether costs of changes or additions should be attributed to the SAR program, and how SAR planners should be involved. To this end the Team has defined the activities, tasks, levels of effort and measures required to influence safety programs. (Table 7-1)

ISSUE	OBSERVATIONS	CONCLUSIONS
2. SAFETY AND SAR PREVENTION PRIORITIES DIFFER	. (VI/3.57/1) There are no ministerially approved strategic or program objectives for SAR operations or prevention activities.	
3. TARGET POPULATIONS AND INCIDENT CAUSES NOT DEFINED	. (IV/3.8/A) Over the past five years, the large majority of SAR related accidents occurred in British Columbia, Ontario and Québec (66%) showing that the SAR prevention target population operates primarily in these provinces. . (IV/3.8/b) Inexperienced private licensed pilots, mainly conducting recreational and business operations, were involved in 45% of SAR related accidents over the past five years. In contrast, more experienced commercial licensed pilots, mainly conducting charter operations, were involved in approximately 26% for a cumulative total of 71% of the SAR related accidents. . (II/3.18) Tables 3-10 and 3-11 A, B and C portray the causes of SAR distress for 1976-1980. . (IV/3.5/f) No aircraft with more than two engines was involved in a SAR-related accident during the reporting period and only one accident to a private licensed two engine turbo-fan aircraft was reported (Churchill Falls).	. (IV/3.9/a) An analysis by the Team of the 323 air accidents involving SAR over the years 1976-1980 showed that two-thirds took place in Ontario, Québec and British Columbia. In BC, the presence of mountains was a significant cause factor. One-half of these accidents involved inexperienced private pilots, and one-quarter were pilots of small commercial charters. Aviation SAR prevention efforts should therefore focus on these classes.
	. (IV/5.4) (a) Pleasure craft accounted for 59% of both distress and non-distress SAR incidents. . (b) 61% of all reported incidents occurred in Victoria SRR. . (c) Fishing vessels accounted for the second highest overall incident rate but represented by far the largest SAR activity in the Halifax SRR, for both distress and non-distress.	. (IV/5.5/a) One-third of all incidents arise from pleasure craft non-distress incidents in the Victoria region, usually as a result of breakdowns. Fishing vessels have the highest incident rate in relation to their number. Marine SAR prevention efforts should therefore focus on fishermen and pleasure boaters.

ISSUE	OBSERVATIONS	CONCLUSIONS
3. TARGET POPULATIONS AND INCIDENT CAUSES NOT DEFINED	• (d) The most significant types of non-distress incidents are breakdowns (50%). • (e) 12% of all non-distress incidents showed either no information or "other" for type of vessel involved in the incident. • (f) 38% of all non-distress incidents showed either no information or "other" for type of emergency. • (h) 64% of all non-distress incidents showed either no information or "other" for cause of incidents.	
4. INSUFFICIENT INVESTIGATION, ANALYSIS AND FOLLOW-UP	• (IV/6.5) To carry out its functions, Casualty Investigation has a mandate to investigate the cause of any accident to any ship, whether attended by loss of life or not. This includes all groundings, collisions, capsizings and sinkings. Although approximately 1,000 such casualties occur each year, present staffing levels allow only about 200 to be pursued. As a result, those accidents that are investigated tend to be the ones involving deaths, collision, commercial implications or high public interest. • (IV/6.9/a) Information gathered from investigation of SAR incidents is inadequate to design and target a SAR prevention program effectively. • (IV/6.9/b) Casualty Investigation Branch (CCGI) is not staffed to investigate all SAR distress incidents adequately. • (IV/6.9/c) CGVR does not analyse CCGI Reports in detail for the purpose of accumulating information on probable causes of incidents investigated by CCGI that relate to SAR.	• (IV/6.10) Existing staffing levels within the Canadian Coast Guard permit investigation of only 200 of 1,000 reported groundings, collisisions, capsizings and sinkings. SAR division makes little use of the limited analysis being done on these casualties. Further, there is no continuing organized analysis of SAR incident patterns, characteristics and causes, who is involved, aid requirement, who responded, cost of response, trends and information, all of which is essential to the design of effective prevention programs and response postures.

ISSUE	OBSERVATIONS	CONCLUSIONS
4. INSUFFICIENT INVESTIGATION, ANALYSIS AND FOLLOW-UP	. (IV/4.18/a) DND forwards its SAR reports on civil aviation occurrences to a variety of offices in CATA Headquarters but there is no central co-ordinating authority responsible for monitoring, analyzing or implementing these DND findings and recommendations. This indicates that CATA is not organized to handle SAR prevention matters in a satisfactory manner. . (IV/4.18/b) CATA does not generally provide ICSAR with the findings and recommendations with SAR prevention implications from its enforcement and accident investigations nor has ICSAR requested these reports. This policy and planning committee is thus deprived of a valuable source of expertise and information for establishing the root causes of SAR incidents and for recommending appropriate SAR prevention measures for application to civil aviation in Canada. . (IV/4.18/c) In view of impending establishment of the Canadian Aviation Safety Board (CASB) and the apparent divided and unco-ordinated nature of the federal government organization and process for investigating SAR incidents, placing this function in the proposed CASB merits consideration, Alternatively, investigation findings and recommendations on SAR prevention, produced by either the public or private sector of the aviation community in Canada, should be tabled and discussed by all interested parties through national and regional aviation SAR prevention councils.	. (IV/4.19) There should be better co-ordination of SAR related accident and incident investigations and reports between DND and CATA and within CATA. The team also believes that wider publicity of the results of SAR accident investigations would increase public awareness of SAR incident causes and consequences.

ISSUE	OBSERVATIONS	CONCLUSIONS
5. PROMOTION AND EDUCATION EFFORT LACKS FOCUS AND CO-ORDINATION	. (IV/6.52/c) BOSLETS, in some regions, visit inland areas to promote SAR prevention, perhaps duplicating efforts of other agencies. . (IV/6.52/d) Crews at lifeboat stations do not get involved in promoting and educating for SAR prevention. . (IV/6.52/e) CMRA is not yet involved in promotion and education or in Courtesy Inspections. . (IV/6.55/b) Since the Ship Safety Branch of the Canadian Coast Guard is structured to deal with the major sub-activities of accident prevention, it would appear that more effective SAR prevention programs could be achieved through enhancement of Ship Safety Branch to include SAR prevention, rather than vesting this responsibility totally with the SAR division of Fleet Systems Branch. . (IV/6.55/c) Because of the similarity in design and delivery of accident prevention and SAR prevention programs, responsibility for SAR prevention should rest with the Canadian Coast Guard and, in particular, with the Ship Safety Branch, which is best structured to undertake all aspects of marine prevention. . (IV/6.55/d) The SAR division of Fleet Systems Branch of the Coast Guard should be responsible for the identification of SAR prevention target populations, based on analysis of SAR data; for identification of causes of SAR incidents, based on increased investigative efforts and analysis; for informing Ship Safety Branch of this SAR-oriented information; for planning with Ship Safety Branch at the regional level for possible shared delivery of safety and SAR prevention programs; and, in general, for co-ordinating the identification of the SAR requirements related to marine accident prevention.	. (IV/6.54) The Team concluded that some of the effort going into BOSDET activities could be more usefully expended on improving the co-ordination of the safety education efforts provided by the CMRA and other organizations and on training to educate, rather than educating the public directly. . (IV/6.56) The Team believes that appropriate and effective division of responsibility would be for a new Small Craft Division in the Ship Safety Branch to lead in the design and delivery of SAR prevention measures. The SAR division would identify the target populations for SAR prevention and the causes of SAR incidents. It would also co-operate with Ship Safety in the field for the delivery of SAR prevention measures, in which SAR vessel crews would continue to be involved.

ISSUE	OBSERVATIONS	CONCLUSIONS
5. PROMOTION AND EDUCATION EFFORT LACKS FOCUS AND CO-ORDINATION	• (IV/4.66/) (a) DND Headquarters and Air Command resources are not being fully used to promote SAR prevention awareness, particularly to the civil aviation target population. This is attributable in large part to the fact that DND is not legally responsible for the regulation and education of the civil aviation population in Canada. These responsibilities are assigned to and are assumed by CATA. As a result, there is a noticeable lack of coordination and co-operation between DND and CATA at Headquarters and at some regional levels. • (b) The CATA safety awareness program and Regional Aviation Safety Officer accident prevention programs appear successful in reducing accidents. They offer an established and related structure towards promoting SAR prevention and educating the target population. • (c) It is difficult to identify from current DND and CATA records whether promotion and education measures are reaching the target population; DND and CATA should record details of the size and characteristics of the client populations they address. • (d) There is a wealth of aviation expertise in the Canadian private sector particularly in the larger air carriers, private business corporations, volunteer air associations and provincial aviation councils which could be utilized by the federal government to augment SAR prevention promotion and education efforts. • (e) Insufficient use is made of the media to educate the public on the causes, risks and costs of SAR operations, particularly where these operations were generated by Canadian and US pilots who clearly disregarded accepted aviation standards and practices.	• (IV/4.67) The Team concluded that more formal co-ordination and co-operation between DND and CATA, at headquarters and in the field, could make safety promotion efforts more effective and that such efforts could be considerably augmented by drawing on private organizations. Finally, as a result of discussions with SAR experts and the public, the Team believes there should be greater use of the media to inform the public of the causes of SAR incidents, the risks imposed on SAR personnel and the cost of both necessary and unnecessary responses.

ISSUE	OBSERVATIONS	CONCLUSIONS
6. INADEQUATE STANDARDS FOR OPERATIONS AND PERSONNEL SURVIVAL	. (IV/6.26/a) The Marine Safety Advisory Council could be used for discussion and co-ordination of issues arising from consideration of SAR prevention, such as licensing, standards development, industry liaison and information delivery. . (IV/6.26/b) A means of providing for the licensing of boat operators in the future could be achieved through the development of a common basic standard for small craft operations. This standard could be developed through deliberations of the Small Craft Committee of the Marine Safety Advisory Council which represents the principal parties involved. . (IV/6.24/b) Ship Safety conducts no tests on new small boats under 15 tons unless the design does not fit a standard even though they must display a certification as to maximum permissible engine size. . (IV/6.24/m) There are fewer regulations with regard to vessels in the USA than in Canada. . (IV/6.25/h) Most pleasure craft operators are unaware of their chances of survival in the waters in which they are voyaging.	. (IV/6.27) The Team concluded that agreed standards are an essential basis and precursor of a licensing system and that they would be useful for developing voluntary standards for small boat operator knowledge and competence, whether or not a decision is eventually taken on the desirability of licensing. The Team believes that if the Small Craft Committee of the Marine Safety Advisory Council was used as a mechanism to consult on and co-ordinate the development of such standards, it would be another useful step in achieving a national as opposed to a federal view of prevention.
	. (IV/4.29/a) CATA qualification standards were found lacking for ground school instructors. Private and commercial pilot examination passing standards, particularly in aviation weather, as well as subsequent periodic retesting of air knowledge and flying proficiency are too low. In addition, it was observed that CATA private pilot licence standards are faulty in permitting these pilots to fly visually in mountainous and sparsely settled areas without appropriate training and experience.	. (IV/4.30) Ground school instructors are not certified or checked by CATA although they provide knowledge essential to safe operations. It was also found that it is possible to obtain a private pilot's licence even if the meteorology portion of the ground examination is failed. Government and private sector safety experts interviewed were of the view that standards for maintaining private and commercial pilot licences and for visual flight into mountainous and

ISSUE	OBSERVATIONS	CONCLUSIONS
6. INADEQUATE STANDARDS FOR OPERATIONS AND PERSONNEL SURVIVAL	. (IV/3.3/f) The ELT was a major source (44%) of false alarms over the past five years, indicating that state-of-the-art ELTs may be unreliable. . (IV/4.46/c) Existing state-of-the-art emergency locator transmitters are better than nothing. However, it is evident that a considerable amount of work is required to make the ELT a crash survivable and effective SAR alerting and locating component for carriage in private and small commercial aircraft. Specifically, both the federal government and the Canadian aviation private sector should make a concentrated effort to emphasize the importance of the ELT through regulation and education. At the same time both should work towards increasing the overall reliability and effectiveness of the ELT carriage in small civil aircraft. . (IV/4.46/b) The existing CATA Air Navigation Order (Series V, No.12) pertaining to aviation personnel survival in sparsely settled areas is inconsistent with the realities of seasonal climatic and environmental conditions prevailing in most areas of Canada. In particular, the boundary as defined by CATA, between settled and sparsely settled areas where emergency survival equipment and radio systems must be carried, requires revision. Also, standards and practices for personnel survival should be established and included in flight crew qualification examinations.	sparsely settled areas are inadequate. Expert opinion and the Team's judgment is that standards should be raised in these areas. . (IV/4.47) The Team's analysis of non-distress air SAR incidents showed 44% of false alarms in the period 1976/1980 were activated by ELTs, and that ELTs are not crash-worthy. Thus much remains to be done to make them a reliable alerting and locating device. As noted elsewhere in this report, a special effort and management arrangements will be required. In view of CATA's responsibility for the alerting function, the Team believes CATA should take the lead in this development, with the assistance of other departments. There is also a need to revise the criteria for and the boundary between settled and sparsely settled areas.
7. INADEQUATE ENFORCEMENT ACTION	. (IV/6.37) SAR operational personnel are frustrated in their attempts to enhance the prevention aspect by their inability to enforce regulations unless accompanied by a peace officer.	. (IV/6.59) In view of the fact that United States Coast Guard studies show that boardings and, when appropriate, follow-up enforcement action is a highly effective

ISSUE	OBSERVATIONS	CONCLUSIONS
7. INADEQUATE ENFORCEMENT ACTION	• (IV/6.37/a) RCMP and DOT have difficulty in obtaining court convictions with the result that they rely on warnings. • (IV/6.37/c) Municipal and provincial police can enforce Small Vessel Regulations but seldom do so.	measure, the Team is of the view that consultations should be undertaken with the Solicitor General, the RCMP and Provincial Attorneys General to increase inspections and enforcement actions, and that additional federal resources should be made available so that steamship inspectors can exercise their powers to enforce small boating regulation.
	• (IV/6.37/d) DFO, DOC and CCG each issue certificates for their respective purposes to both vessel and personnel without determining the currency or relevance of the other department's certificates. • (IV/6.37/e) USCG personnel are peace officers and, therefore, do enforce regulations. • (IV/6.38/a) A peace officer may board and inspect a vessel in connection with the enforcement of the Small Vessels Regulations and to detain that vessel to prevent equipment shortfall violations. Steamship inspectors have this authority under the Canada Shipping Act. In addressing marine SAR enforcement activities therefore, both peace officers and steamship inspectors possess the required authority. • (IV/6.38/b) It is apparent that the number of enforcement actions and inspections is small in relation to the approximately 1,400,000 pleasure craft in Canada. Further, powers to board and inspect small vessels are not being employed.	
	• (IV/4.53) As noted earlier in this evaluation, the Dubin Commission has been mandated to inquire into CATA enforcement and its sufficiency in meeting flight safety objectives.	• (IV/4.56) The Team concluded that CATA is not effectively enforcing flight planning or weather related and personnel survival regulations and that a significant reason for

ISSUE	OBSERVATIONS	CONCLUSIONS
7. INADEQUATE ENFORCEMENT ACTION	Evidence and complaints presented to the Dubin Commission by CATA regional specialists and by other experts were summarized by Mr. John Sopinka, the Commission's Legal Counsel, on July 28, 1980, when he stated that there is: - lack of clear and intelligible regulations (CATA); - lack of clear guidelines for headquarters (CATA Ottawa); - lack of support from headquarters (CATA Ottawa) for vigorous enforcement; - too few enforcement officers (CATA) and an absence of training for those in place; - inadequate enforcement has resulted in significant air safety violations. It is anticipated that Mr. Justice Dubin will reiterate these statements as findings in Volume 2 of this report which is expected by the end of 1981. . (IV/4.54/h) The RCMP has not consistently co-operated and co-ordinated with DOT enforcement specialists before laying charges under the Aeronautics Act. This problem area has been identified both by CATA and RCMP. As a result, more regional CATA/RCMP seminars are being held, RCMP Divisional Investigative training courses will soon include CATA enforcement specialists and a recent RCMP national policy bulletin, OM-126 indicates that the RCMP recognize that liaison with CATA is essential for professional handling of RCMP detected aeronautics violations including SAR related violations. . (IV/4.55/a) In view of the activities of the Aeronautics Act Task Force and the evidence presented to the Dubin Commission, CATA enforcement specialists and agencies, including police forces are neither staffed nor	this is a lack of sufficient enforcement personnel. In the interest of reducing SAR incidents, this could and should be quickly remedied. Action should also be taken by DOT/CATA, through discussion with the Solicitor General and RCMP and with officials of Provincial Attorneys General, to arrive at a co-ordinated national approach to achieving more vigorous enforcement.

ISSUE	OBSERVATIONS	CONCLUSIONS
7. INADEQUATE ENFORCEMENT ACTION	trained to deliver effective SAR prevention enforcement measures at this time. Of particular concern to SAR prevention is CATA's inability to enforce the provisions of flight planning, weather operating minima and personnel survival regulations and orders effectively. This suggests that in the interests of SAR prevention, CATA should not wait for the resolution of the Aeronautics Act Task Force and Dubin Commission recommendations but rather should begin increased enforcement action in these areas.	

ACTIVITIES IMPINGING ON SAR

ISSUE	OBSERVATIONS	CONCLUSIONS
1. IMPROVEMENTS REQUIRED IN AIR NAVIGATION AND AVIATION AND MARINE WEATHER SERVICES	. (V/2.09/1) CATA does not formally encourage private pilots to file VFR flight plans in advance of potential heavy traffic situations such as occurs on weakends in the summer months. Instead, CATA requirements are such that a pilot can file a flight itinerary with a responsible person in lieu of a flight plan. It is difficult for private pilots wishing to file a flight itinerary to contact flight planning agencies in some urban areas either to open or close VFR flight plans. This situation creates, in private pilots, a sense of apathy and sometimes hostility towards the flight planning system. In response, DOT/CATA advised that a flight planning review committee has been established by DGCA and has recommended required improvements at urban centres. . (V/2.10/a) As matters now stand, target population pilots are mainly reliant on flight service station units for air traffic services. These units do not provide an enroute VFR flight following service. This lack of service can produce undue delay in SAR response and increase the area of search required. . (V/2.10/b) The rules, regulations and orders governing the conduct of enroute visual flight require revision. The work of the CATA Aeronautics Task Force in this area should ensure a higher level of SAR prevention. . (IV/4.46/a) Existing CATA regulations and orders for flight planning under visual flight rules permit pilots too wide a discretion in flight following and reporting standards and this results in an undue workload on SAR operations resources. It would	. (V/2.11) The lack of an enroute flight following service for pilots flying under Visual Flight Rules contributes to notification delays and expands the area which must be searched. Since notification times exceed response times, the Team believes that rules, regulations and orders governing visual enroute flight require revision and that the work of the CATA Aeronautics Task Force in this area should be given priority. Moreover, CATA should take appropriate measures to increase capacities to accept VFR flight intentions during peak flying periods.

ISSUE	OBSERVATIONS	CONCLUSIONS
1. IMPROVEMENTS REQUIRED IN AIR NAVIGATION AND AVIATION AND MARINE WEATHER SERVICES	be prudent for CATA and ICSAR to discuss these flight planning regulations and orders before implementing new flight planning procedures.	
	. (V/2.20/a) The client and target populations of Canada are well served both by CATA and DND and by private sponsored aeronautical publications. In particular, the scope and general quality of the CATA Aeronautical Information Handbook (AIP) which was recently issued to all Canadian licensed pilots was applauded by experts. In contrast, the FAA has no equivalent to the AIP in either distribution or quality and FAA officials expressed envy of this Canadian effort.	. (V/2.21) Aeronautical information services provide pilots with information facilities, systems, procedures and standards. The Team has concluded that Canadian aeronautical information services are of a high calibre. However, stronger efforts are desirable to ensure that U.S. private licensed pilots, who are frequently involved in SAR incidents, have ready access to and use of Canadian aeronautical flight information publications before entering Canada.
	. (V/2.20/b) US private pilots conducting flights in Canada generally are ill-informed on the rules, regulations and environmental factors which are special to Canada. CATA FSS units are set up to accommodate these needs such as by providing the AIP and other information at border points but some US pilots fail to take advantage of this service through either ignorance or disinterest.	
	. (V/2.20/c) CATA and DND regional staffs have made special efforts to publicize features that are unique to their regions but a national campaign directed at US and other foreign visiting pilots has so far not been implemented by either of these department's national headquarters or through the Department of Industry Trade and Commerce and its provincial counterparts.	

ISSUE	OBSERVATIONS	CONCLUSIONS
1. IMPROVEMENTS REQUIRED IN AIR NAVIGATION AND AVIATION AND MARINE WEATHER SERVICES (CON'T)	. (V/2.26/a) According to CATA, DND and private sector users, the overall reliability and accuracy of aviation weather forecasting has deteriorated significantly during the past two decades for flights to be conducted below 10,000 feet and to the smaller airports in Canada where the large majority of the target population operates. The existing criteria are directed primarily towards serving the larger air carriers (Class 1 and 2) who utilize the upper levels of airspace and the larger airports in Canada. In response to users, AES officials stated that over the past two decades, the activity within the target population has expanded explosively with no concomitant expansion in the resources made available to AES to provide the service. A comparison of the resources used in producing services to aviation in 1970 and in 1980 would show a decrease in real terms, in spite of an increase in the activity. Since Transport Canada (CATA) has the responsibility to specify in detail the requirements of aviation for weather service, then to obtain from the Treasury Board the resources required to meet those needs, it would seem more accurate to identify as the cause of any reduced service either CATA or TBS policy. One might even question whether or not the CATA decision some years ago to use less well-trained Flight Service Specialists to provide the information to pilots (rather than the highly trained weather service specialists of the AES) has contributed to the perceived deterioration of service.	. (V/2.28) The Team notes that it is CATA's responsibility to make the case for resources and specify the quality and levels of service. Weather is a factor in nearly forty percent of air distress incidents so the importance of ready access to good quality forecasts cannot be overemphasized. The Team believes that, from the SAR point of view, improvements in the areas should be given high priority.

ISSUE	OBSERVATIONS	CONCLUSIONS
1. IMPROVEMENTS REQUIRED IN AIR NAVIGATION AND AVIATION AND MARINE WEATHER SERVICES (CON'T)	. (II/3.18/b) The most identifiable causes of air distresses that result in accidents are weather related. SARSTATS show 17% and TC/AIDS show 39%. Pilots either fly into weather conditions beyond their ability or the aircraft's capability to handle, with the resultant tragic outcome.	
	. (V/3.9/a) The Atmospheric Environment (AES) weather forecasting and reporting services have deteriorated over the last few years. . (V/3.9/b) A large number of pleasure craft operators do not know where to obtain marine weather information. . (II/3.33) Table 3-16 shows the reason for the emergency. The largest identified factor nationally is weather, which accounts for 12% of the incidents.	. (V/3.10) The team was informed, on several occasions across Canada, that the accuracy of and access to local marine forecasts need improvement. At ICSAR's request, AES is currently studying means of improving dissemination of weather information to small boaters. An appropriate action plan is needed at this juncture.

SAR MANAGEMENT PROCESS

ISSUE	OBSERVATIONS	CONCLUSIONS
1. NATIONAL OR FEDERAL SAR PROGRAM	. SAR System Performance	
	. (III/2.87/a & II/2.92/a) Primary marine and air capability is well trained and equipped; there is room for improvement in some areas. . (II/5.3 & Appendix II/2) Of lives lost, many were lost prior to or without notification of RCCs (Marine: short survival times, air: crash fatalities). . (II/5.2, 5.3) Effectiveness in saving lives still at risk at time of notification very high. . (II/2.22/d, e) Notification times frequently exceed transit times. . (II/5.3) Number of lives lost in marine environment not decreased though number of primary SAR vessels doubled from 1976-1980. . (II/3.29, 3.43, 3.44, 3.51) New federal vessels displace previously provided selfhelp or ships of opportunity. . (III/2.26/a) Vessels of opportunity provide fastest response and the best means of saving lives.	. (III/6.1/b) Improved technology which could substantiall improve the performance of the SAR system is not being fully exploited. . (III/3.19/1&2) There are more cost-effective marine force postures than the proposed 1982/83 SAR Plan: more volunteers in own craft, and as partial or full crew on CCG craft, together with CCG lifeboats and cutters of improved performance. . (VI/5.23) Increasing the number of federal aircraft, ships and bases probably not the most cost-effective way to shorten times to incident site, or to provide aid. . (VI/5.23) CCG approach to marine postures is potentially open-ended in cost.
	. Public Perceptions	
	. (II/2.6&2.11) Sees federal government as main player. . Accordingly blames federal SAR forces and federal government when lives are lost. . more federal aircraft, ships and bases required.	. (III/6.1/b & m) Cost-effective ways to improve SAR system not in accord with public perception. . (III/4.62/e) Need better informed public on causes, circumstances, and costs of SAR response and of risks to SAR personnel. . (III/2.40 & III/6.1/a) Need better informed public on levels of service standards, and thus extent of responsibility to take measures for own survival. . (III/2.50/10, III/6.1/m & III/2.42) More effective marine

ISSUE	OBSERVATIONS	CONCLUSIONS
1. NATIONAL OR FEDERAL SAR PROGRAM (CON'T)		postures involving greater use of volunteers gives sense of participation, better understanding of SAR system capabilities.
	. (II/1.30/e) There are many provincial and private organizations with an interest in and capabilities for search and rescue. This role is not specifically recognized in the National SAR Plan, nor does the option of encouraging their expansion seem to have been seriously considered.	. (II/6.1/a) The existing National SAR Plan is a federal plan which takes little account of existing or possible expansion of provincial, municipal or private sector participation. Thus, the existing SAR response system does not make full use of facilities which could be adapted to SAR needs. Consequently, federal over-resourcing for SAR is a distinct possibility. . (II/6.1/b) Greater use of provincial and municipal resources and greater reliance on the commercial private sector are feasible options for the conduct of SAR operations and in SAR prevention. A resourcing philosophy based on such an approach would be consistent with IMCO and ICAO agreements and, as the Team's analysis in other parts of the report shows, could lead to a more effective SAR program.
2. IMPROVEMENTS IN SAR PROGRAM SLOW	. (VI/5.37) Action in implementing Cabinet directives slow. . Initiative for change comes mainly from central agencies. Differing Departmental Perceptions . (VI/5.5) In Canada "Search and Rescue" is what a search and rescue service does. The term is nowhere defined in COG or operations manuals or in policy directives. In contrast, both the USA and Australian manuals define the term, and limit it to distress.	

ISSUE	OBSERVATIONS	CONCLUSIONS
2. IMPROVEMENTS IN SAR PROGRAM SLOW AMBIT OF SAR	. (VI/5.16) Current proposals to ministers for additional resources are justified partly on the grounds of increases in all incidents. If the meaning is to be observed, provision of aid in non-distress, and humanitarian and civil aid are not within the ambit of search and rescue.	. (VI/5.18) SAR should be defined so as to exclude the provision of aid in non-distress, humanitarian and civil aid.
FEDERAL ROLE	. (VI/5.6) Unlike in the U.S.A. and Australia, in Canada the responsibilities of various national provincial and local authorities, and the various federal SAR forces are not defined clearly relative to one another, nor are the circumstances clearly set out under which responsibilities should pass from one authority to another. Thus neither SAR operational forces nor RCC,s nor SAR planners have a clear or common concept of where their responsibilities for SAR begin or end.	
	. (VI/5.7) There is a tendency for marine SAR planners and forces to assume the responsibility for response to incidents which in other countries would be the responsibility of state and local authorities.	
	. (VI/5.7) By way of contrast, in Australia, state authorities are responsible for small craft in inshore coastal waters. In Canada, marine SAR planners have established a parallel CMRA organization even though in B.C. the Provincial Emergency Program office was already active in supporting volunteers both inland, and in coastal areas.	
	. (VI/5.7) Ontario provincial police have shown a willingness to assume responsibilities for close inshore waters, at least in certain areas of the Great Lakes, as have the Toronto Harbour Police.	. (VI/5.9) The federal role should be defined. The definition should reflect Canadian responsibilities under ICAO and IMCO agreements, and existing Cabinet directives.

ISSUE	OBSERVATIONS	CONCLUSIONS
2. (CON'T)	• (VI/5.8) Neither IMCO, SOLAS nor ICAO agreements imply the provision of any particular level of service, or that coverage should be by dedicated forces.	
ROLE OF OTHER JURISDICTIONS	• (VI/5.10) For clarity, and as a basis for further consideration of the desirability of provincial and local authorities assuming some responsibility for close inshore waters, at least on the Great Lakes, a codification of existing relative responsibilities also appears desirable.	• (VI/5.10) The codification should reflect the definition of the federal role, and be consistent with existing agreements between SRR commanders and provincial and local authorities. • (VI/5.12) The codification should be confirmed by ministers.
CANADIAN AREA OF RESPONSIBILITY	• (VI/5.11) A definition of the geographical area of Canadian responsibility also appears desirable.	• (VI/5.11) The definition of the Canadian area of responsibility should be consistent with IMCO and ICAO agreements and previous Cabinet directives. • (IV/5.12/1) The definitions of relative federal roles and areas of responsibility should be confirmed by ministers. • (IV/2.15/2) The possibility of other jurisdictions playing a greater role, at least in close inshore waters and the Great Lakes, and in support of volunteers in British Columbia should be explored.
FEDERAL SAR PROGRAM STRUCTURE	• (VI/5.19) A SAR Program Structure is an essential building block in achieving a SAR program which reflects government rather than departmental priorities for meeting SAR needs. • (VI/5.20) The structure also provides a framework for a Long Term Program Plan which allows for a long lead time between defining requirements and acquiring capital resources. • (VI/5.20) The Evaluation Team has defined the federal SAR program as having four program elements: management, operations, prevention and	

ISSUE	OBSERVATIONS	CONCLUSIONS
2. IMPROVEMENTS IN SAR PROGRAM SLOW (CON'T)	programs impinging on SAR, and also has defined the objectives of the operations and prevention elements. . (VI/5.19) Proposals for departmental objectives in the 1969 TBS working group proposals and in SARCORE have gaps because they were not developed in the context of a SAR program structure.	. (VI/5.22/2) The various elements of the National SAR Program should be defined with the responsibilities for their planning and execution clearly set out and assigned to departments. Departmental objectives should reflect this assignment. . (VI/5.22/3) The Team's definition of the SAR Program as having management, operations, prevention, programs impinging on SAR elements, and of objectives, activities and tasks for the operations and prevention elements is consistent with the issues and areas of activity ministers have asked to be dealt with in the context of, and should be used as an initial basis for the definition of, the SAR Program.
MANAGEMENT FOCUS	Differing Departmental Perceptions Unresolved . Many examples of unresolved matters involving contention between departments include: . (VI/3.33) Adequacy of enforcement of air regulations (DND/CATA) . (VI/4.2/1) Needed improvements to SARSTATS (DND/CCG) . (VI/3.67) Costs and levels of multi-tasking (DFO/CCG) . (VI/3.55, 5.8) Rotary and fixed wing coverage for marine response (DND/CCG) . (VI/1.14) Means to measure effectiveness. Need for Management Focus . (VI/5.39) ICSAR provides a consultative forum which has not been successful in resolving contentious	

ISSUE	OBSERVATIONS	CONCLUSIONS
2. CON'T	differences of view between departments. . (VI/5.38) The two co-chairmen of ICSAR represent organizations with very different points of view on many aspects of the SAR program. With dual chairmanship ICSAR is only successful in taking the lead in resolving issues on which both organizations can readily agree.	(VI/5.46/3) A single line of responsibility for planning, programming, monitoring and evaluation through a responsible minister should be established as an initial step in improving the federal SAR program.
STRENGTHENING OF ICSAR	. (VI/5.42) The organizational relationships and respective responsibilities of ICSAR members, the ICSAR Secretariat, SAR foci, and other parts of departmental organizations in relation to each other are not clearly or fully set out.	. (VI/5,46/3) This line of responsibility should run from the departments concerned to a single Chairman of ICSAR to the responsible minister. . (VI/5.41) Based on experience of other interdepartmental machinery, the Secretariat should, in addition to a head, have three full time officers. . (VI/5.41) To ensure its independence, the Secretariat should be established as a separate responsibility centre, reporting through its director to the Chairman. . (VI/5.46/4) The specific responsibilities of ICSAR, its Secretariat, and of activity and task co-ordinators for planning, programming, implementing, monitoring and evaluation of the federal SAR program, and for its overall policies, should be defined.
	. (VI/5.45) It may also be argued that greater centralization in a separate authority which would set the requirements and arrange with departments and the private sector for the execution of the program and control resources, would work even better than a strengthened ICSAR and, given the difficulties there have been in achieving an optimum program, this	

ISSUE	OBSERVATIONS	CONCLUSIONS
2. IMPROVEMENTS IN SAR PROGRAM SLOW (CON'T)	may in the long run prove the only effective organizational solution. . (VI/5.45) The proposed strengthened ICSAR machinery would represent an evolution which could lead to or stop short of (the above) highly centralized machinery or the assumption by the Minister of Transport of the responsibility for the SAR program. The evolution represented by the changes in ICSAR would not preclude leaving responsibility with the Minister of National Defence, or assigning it to a third minister.	
MINISTERIAL RESPONSIBILITY	. (VI/5.44) Given the current DOT responsibilities for marine response, and for air and marine safety, and the fact that the most important trade-off is more prevention as opposed to more operations, and the importance of good access to accurate weather forecasts, the requirements for and definition of which are also DOT responsibilities an argument can be made that, as in most other countries, the Minister of Transport should be designated the responsible minister. . (VI/5.44) Another possibility would be to assign the responsibility for the SAR Program to the minister responsible for emergency planning.	. (VI/5.46/6) Consideration should be given to the desirability of a single separate organization, reporting to one or other of the Minister of Transport or Defence, or some other minister, which would set the requirements for and arrange with departments for the delivery of various elements of the SAR program, and control resources.
	Resource Constraints	
	. (VI/3.36/3) DND has been inhibited by the manpower and funding constraints of the DSP from making proposals for inclusion in the National SAR Plan, in particular for the years 1979/80 through 1981/82. . (VI/2.20) Since 1976 DND has responded, and continues to respond to ministerial requests for changes in force postures by altering the	. (VI/5.46/2) The current arrangements for financial control of the SAR program are inconsistent with ministers' view that SAR planning be in the context of SAR needs overall rather than departmental priorities.

ISSUE	OBSERVATIONS	CONCLUSIONS
2. IMPROVEMENTS IN SAR PROGRAM SLOW (CON'T)	disposition rather than the number of aircraft provided. • (III/2.33/a) The recently proposed move of a helicopter from Gander to Comox will reduce response reliability of primary forces at Gander. • (VI/4.2/2) Needed improvements in SARSTATS have been delayed by lack of manpower. • (III/2.66/a/b/c & VI/3.30) RCCS are poorly housed and equipped. • (VI/3.31) The installation of VHF/FM equipment in SAR aircraft will have taken more than ten years from the time the need was originally identified. • (III/2.33/a) The retirement of the Argus has left a gap in air drop capability out to the far reaches of Canada's Atlantic and Pacific responsibility until the Aurora is suitably equipped. • (VI/5.30) There are no attrition aircraft for SAR.	
FINANCING FROM ONE ENVELOPE	• The fact that SAR needs are resourced from both the economic development and foreign and defence policy envelopes complicates and increases the time to develop advice and to take decisions.	• (VI/5.34) The Team is of the view that SAR should be financed from a single envelope in the interests of simplifying decision making and reducing delays, and that SAR needs should be taken into account in setting the envelope.
3. INADEQUATE BASIS FOR MINISTERIAL DECISIONS TRADE-OFFS	Alternatives • (VI/2.6 & VI/5.3) The annual SAR Plan is mainly a marine SAR plan which provides no options for ministerial consideration, nor is it convincing. The choices have already been made by DND and DOT when the plan is put forward. • (VI/2.17 & VI/3.5) The consequences of differing program thrusts or of spending more or less than proposed	• (VI/5.4/1) Ministers' purposes in creating ICSAR that the SAR program reflect ministerial rather than departmental priorities, have not been met. • (VI/5.4/3) Ministers collectively are not receiving the information they require to make informed decisions about the level of SAR operations or prevention or

ISSUE	OBSERVATIONS	CONCLUSIONS
3. INADEQUATE BASIS FOR MINISTERIAL DECISIONS (CON'T)	are not displayed, in spite of the fact that ministers have requested alternatives be put before them.	alternative ways of delivering SAR response, or on how programs impinging on SAR affect or could affect the need for SAR. • (VI/5.46/1) Alternative program mixes and resources levels, together with the advantages and disadvantages should be presented to ministers to help ensure the SAR program does not remain a collection of activities, the proposed direction and level of which is mainly determined by the deparments.
	Policies for use of SAR Resources	
	• (VI/t.16) Ministers have repeatedly called for policies covering such matters and for cost recovery.	• (VI/5.16) To ensure the necessary priority is given to this work, goals should be developed for the presentation to ministers of proposals for the use of SAR forces for humanitarian and civil aid and non-distress.
PRIORITIES	• (VI/5.23) Ministers have previously directed prevention be given the highest priority, et seq. • (VI/5.23) Recent DND/CCG review of the Victoria SRR shows that of the lives being lost many cannot be saved through an improved SAR response capability. (SEE ALSO SAR MANAGEMENT ISSUE 1, SAR SYSTEM PERFORMANCE)	• (VI/5.23) Team's view is that prevention is probably the most cost effective alternative: • (II/5.2&5.3) SAR system performance currently high, and • (II/5.3) Many lives lost before or without notification. • (VI/5.23) Loss can only be avoided through improved prevention and improvements in programs impinging on SAR, and reductions in notification and decision times.
	• (VI/2.6) Annual SAR plan has been mainly a vehicle for advising ministers on need for marine resources. • (VI/2.7) As exploration and exploitation of off-shore resources intensifies, as fishing vessels venture farther off-shore, the participation of air resources in marine SAR is likely to increase.	• (VI/2.23) Ministers should have an opportunity to consider air and marine requirements jointly and the possible trade-offs between them. Because of the long lead times for DND capital items there is a need to extend the time horizon of SAR planning. This, and the need to reflect strategic overviews concretely, suggests

ISSUE	OBSERVATIONS	CONCLUSIONS
3. INADEQUATE BASIS FOR MINISTERIAL DECISIONS (CON'T)	. (VI/2.22) A separation of SAR planning information in two parts, the first a long term plan, put forward and updated at the same time as strategic overviews could be the basis for secondly the annual estimates submission. Such a long term plan, when approved, would be most useful if it provided guidance on the scope of the SAR program and its structure, assigned to departments lead responsibilities for activities and tasks required to carry it through, and presented resource mix alternatives for consideration including plans for air response.	there should be a SAR Program Long Term Plan to provide a framework for the annual federal Plan.
	. (III/1.24) A description of the important activities and events which occur between the occurrence of an incident and the completion of the SAR mission set out by the Team on a "SAR time Line" provides a basis for indicators and measures of SAR operations.	. (III/6.1/c) The process of a SAR incident from its origin to its termination is not adequately defined. Without this no measure of operations performance is possible.
CRITERIA FOR CHOICE	. (III/1.29) Descriptors of specific players and events, the numbers of such categories, and of SAR operations performance are required. These measures can then be compared with standards and goals stated for achieving them. Indicators of the effectiveness of SAR operations are then possible.	
	. (III/1.30) A structure for descriptors of the client, survivors and factors in survival, the incident, and the response action, has been provided. The descriptors could be included in SARSTATS. Several descriptors currently in SARSTATS could be deleted.	
	. (III/1.33) A minimum list of indicators has been provided by the Team for program work-load, resource inventory, resource expenditure and results, and program effectiveness.	. (III/1.34(c) An organized system of descriptors and indicators is necessary to measure the performance of SAR operations and its effectiveness.

ISSUE	OBSERVATIONS	CONCLUSIONS
3. INADEQUATE BASIS FOR MINISTERIAL DECISIONS (CON'T)	. (III/4.30/b) A basic operations research model (described in III/4.20) is available to assist in determining the kind and location of marine SAR vessels.	. (III/4.30/b&VI/5.43/3) The operations research model, and the costing model used by the Team for force posture analysis provide useful tools for force-posture analysis, and should be further developed under ICSAR's general direction.
CRITERIA FOR CHOICE	. (III/3.2) Sections III/1 and III/2 describe the purpose of a SAR system, define the survival problem and then the structure, composition and resourcing of a response system to rescue those in need, within the time span of survival. Assuming the government will provide this SAR service, or see that it is provided, there must be policies on how much equipment and manpower will be made available. To determine the policies, a level of service must be defined and standards and goals derived and stated. Once this is done, the number and location of SAR resources can be determined and alternative methods of delivering the program assessed. The relative roles of resources provided by all levels of government, volunteers and others can then be evaluated.	
	. (III/3.14/a) There is no policy as to levels of service standards and goals for the Canadian SRRs. (b) Objectives, goals and standards for levels of service would provide valuable guidance for resource needs. (c) Goals and standards would show the public the degree of self-help necessary for their own survival. (d) Such goals also provide the basis for a system of performance measurement and to make the best use of operations activities.	. (II/6.1/v) There are no policies on levels of service, standards or goals against which to measure performance. . (III/6.1/1) There is a need for a clearly identified federal SAR program accompanied by a set of policies, levels of service and standards and procedures against which to measure the performance of the program.

ISSUE	OBSERVATIONS	CONCLUSIONS
3. INADEQUATE BASIS FOR MINISTERIAL DECISIONS (CON'T) PUBLIC AWARENESS AND RESPONSIBILITY FOR SURVIVAL	. (III/1.15/e) Survivors should be equipped with appropriate clothing, food for several days and some major first aid equipment. . (III/1.21/a) Elapsed time is the major problem of survival in the water and requires first, flotation gear and secondly, protection from hypothermia. . (II/2.6*2.11) Public sees federal government as main player. . Accordingly blames federal SAR forces and federal government when lives are lost.	. (III/6.1/a) Survivability in both the air and marine environments is dependent on training, time, clothing and season. The public would know better how best to protect itself, and would have a better understanding of the extent to which they must be responsible for their own survival if levels of service standards were published. . (III/4.6.1/e) Need better informed public on causes, circumstances, and costs of SAR response and of risks to SAR personnel.
4. AD HOC ORGANIZATION	. (VI/5.22) Organizational relationships and respective responsibilities of ICSAR members, the ICSAR Secretariat, SAR foci, and other parts of departmental organizations in relation to each other are not defined.	
	. VI/5.33) A number of responsibilities appear to be orphans. There is no focus for improvements to SAR program management overall, or for taking some initial steps to improve the co-ordination of SAR related research and development. As an aid to improving public understanding of the SAR system, it is also, in the Team's view, desirable that an annual review of the causes, character and costs of SAR incidents be produced. Finally, there is a lack of co-ordination of SAR public information and relations programs which needs to be remedied if a better public understanding of SAR and individual responsibilities is to be obtained. The Team believes that decisions in these areas have also been delayed too long.	. (VI/5.32) These responsibilities can conveniently be considered part of the management element of the SAR program and accordingly lead responsibility should be with the management focus.
	. (VI/5.15/1a) CATA has, only with great reluctance and on an ad hoc basis,	. (VI/5.15) The Team is of the view that DOT's responsibilities for

ISSUE	OBSERVATIONS	CONCLUSIONS
4. AD HOC ORGANIZATION (CONT'T)	accepted that it has any responsibilities for SAR. The ad hoc approach to the resolution of ELT difficulties, the unwillingness to accept any responsibilities for the SARSAT program, and the lack of substantive program response to ministerial direction that priority be given to SAR prevention are a reflection of this CATA perception. • (VI/5.15/1b) DND feels strongly that federal leadership in improving the detection and location of SAR air incidents is a CATA responsibility and believes that CATA's SAR objectives should reflect this. ICSAR minutes and correspondence between the two departments concerning ELTs and SARSAT amply demonstrate DND's concern and CATA's unwillingness to accept this particular responsibility on a continuing basis.	the alerting function should carry a responsibility to introduce and use new technology for this purpose as well as to improve existing procedures, and that accordingly DOT should assume the lead responsibility for co-ordinating the alerting activity and related tasks.
DEPARTMENTAL ORGANIZATION CCG	• (IV/6.54/b) Since the Ship Safety Branch of the Canadian Coast Guard is structured to deal with the major sub-activities of accident prevention, it would appear that more effective SAR prevention programs could be achieved through enhancement of Ship Safety Branch to include SAR prevention, rather than vesting this responsibility totally with the SAR division of Fleet Systems Branch. • (IV/6.54/c) Because of the similarity in design and delivery of accident prevention and SAR prevention programs, responsibility for SAR prevention should rest with the Canadian Coast Guard and, in particular, with the Ship Safety Branch, which is best structured to undertake all aspects of marine prevention. • (IV/6.54/d) The SAR division of Fleet Systems Branch of the Coast Guard should be responsible for the identification of SAR prevention	

ISSUE	OBSERVATIONS	CONCLUSIONS
4. AD HOC ORGANIZATION (CONT'T)	target populations, based on analysis of SAR data; for identification of causes of SAR incidents, based on increased investigative efforts and analysis; for informing Ship Safety Branch of this SAR-oriented information; for planning with Ship Safety Branch at the regional level for possible shared delivery of safety and SAR prevention programs; and, in general, for co-ordinating the identification of the SAR requirements related to marine accident prevention.	
	. (VI/5.42) The Team is also of the view that given the increasing importance and visibility of marine SAR, the SAR division of CCG should report to the Commissioner of the CCG.	. (VI/5.46/5) The nature of SAR requires that the SAR division of the CCG report direct to the Commissioner CCG.
5. MANAGEMENT AND FINANCIAL CONTROLS	. (VI/4.10/3) Differences between departmental financial resources data in form and content result in inconsistencies in determining SAR program costs.	. (VI/4.11/1) ICSAR does not have available to it consistent or accurate costs for the SAR program.
	. (VI/4.10/4) No information was readily available on the costs of SAR prevention activities.	. (VI/4.11/2) Improved financial information must be developed at the departmental level if useful and reliable information is to be available concerning cost-effectiveness of the SAR program.
	. (VI/5.34) Improved overall program control requires reconciliation of costing of the annual plan through agreed estimating procedures with reports on what is actually spent.	. (VI/5.34) In the absence of an integrated financial control document, an integrated plan will not be achieved, there will be little incentive to improve financial management systems, the costs of the SAR program will remain a partial mystery, and there is no hope of measuring the cost side of cost-effectiveness.
	(See 2, Federal SAR Program Structure)	

ISSUE	OBSERVATIONS	CONCLUSIONS
5. MANAGEMENT AND FINANCIAL CONTROLS (CON'T)		. (VI/3.66/g) The SAR system lacks the appropriate current policy and joint procedures manuals to support integrated co-ordination of SAR operations amongst the several departments concerned. . (VI/2.65) There is a definite need for an integrated series of current manuals and documents that cover the flow of SAR responsibilities from the national level to the units. . (VI/5.35) Closer control of SAR responsibilities could be obtained if the resources which CCG, DOT and other participants in the SAR program were under separate allotment control. This would help ensure that new funds received through the ICSAR process are spent for the purposes acquired, and that in "X" cuts, the SAR program is considered as a whole, rather than in parts by individual departments.
	(SAR PREVENTION ISSUE 4 - INSUFFICIENT INVESTIGATION ANALYSIS AND FOLLOW-UP)	
PERSON-YEAR IMPLICATIONS		. (IV/6.10) Existing staffing levels within the Canadian Coast Guard permit investigation of only 200 to 1,000 reported groundings, collisions, capsizings and sinkings. SAR division makes little use of the limited analysis being done on these casualties. Further, there is no continuing organized analysis of SAR incident patterns, characteristics and causes, who is involved, aid requirement, who responded, cost of response, trends and information, all of which is essential to the design of

ISSUE	OBSERVATIONS	CONCLUSIONS
5. MANAGEMENT AND FINANCIAL CONTROLS (CON'T)		effective prevention programs and response postures. • (IV/4.19) There should be better co-ordination of SAR related accident and incident investigation and reports between DND and CATA and within CATA. The team also believes that wider publicity of the results of SAR incidents investigations would increase public awareness of SAR incident causes and consequences.
	(SAR PREVENTION ISSUE 5 - PROMOTION AND EDUCATION EFFORTS LACKS FOCUS AND CO-ORDINATION)	• (IV/6.55) The Team concluded that some of the effort going into BOSDET activities could be more usefully expended on improving the co-ordination of the safety education efforts provided by the CMRA and other organizations and on training to educate, rather than educating the public directly. • (IV/6.56) The Team believes that appropriate and effective division of responsibility would be for a new Small Craft Division in the Ship Safety Branch to lead in the design and delivery of SAR prevention measures. The SAR Division would identify the target populations for SAR prevention and the causes of SAR incidents. It would also co-operate with Ship Safety in the field for the delivery of SAR prevention measures, in which SAR vessel crews would continue to be involved. • (VI/5.46/6) Additional person-years and financial resources should be made available in the ICSAR Secretariat.

RECOMMENDATIONS

SAR MANAGEMENT

The Evaluation Team recommends that:

A NATIONAL SAR PROGRAM

(1) Canada's responsibilities for search and rescue be discharged through the development of a National Search and Rescue Program with roles for federal, provincial and local authorities within their defined areas of jurisdiction, and participation by the private sector and members of the public in program development, co-ordination and execution, in accordance with SAR system response time and survival standards made known to the public.

OBJECTIVE AND AMBIT

(2) The objective and ambit of the National SAR Program be defined as:

> "To prevent loss of life and injury through search and rescue alerting, responding and aiding activities which use public and private resources; and by ensuring appropriate priority to aviation and marine safety measures focused on owners and operators most commonly involved in SAR incidents".

AMBIT OF SAR

(3) Search and rescue be defined as:

> "Search and rescue comprises the search for and provision of aid to persons who are, or are feared to be in distress or imminent danger".

FEDERAL ROLE

(4) The federal role in search and rescue be defined as:

> "The federal role is to provide for air and marine search and rescue within the area for which Canada has accepted responsibility".

ROLE OF OTHER JURISDICTIONS

(5) The relative responsibilities of various national, provincial, and local authorities for search and rescue be defined as set out in Annex A.

CANADIAN AREA OF RESPONSIBILITY

(6) The Canadian area of responsibility for air and marine search and rescue be defined as:

> "The Canadian area of responsibility for air and marine search and rescue is as provided for under ICAO agreements, air search and rescue covering Canada and out to 30^0 West in the Atlantic and 145^0 West in the Pacific, and under IMCO agreements, marine search and rescue on the Great Lakes, the St. Lawrence River and waters out to 300 West in the Atlantic and 1450 West in the Pacific".

RESPONSE STANDARDS

(7) The levels of service standards developed by the Team, and attached as Annex B, be adopted.

PUBLIC AWARENESS AND RESPONSIBILITY FOR SURVIVAL

(8) The public be informed through public information and education programs of the causes, circumstances and costs of SAR incidents and the risks borne by SAR personnel, of the existing performance of the SAR program in responding to incidents and of the individual's responsibilities for taking personal safety measures.

MANAGEMENT FOCUS

(9) There be one minister responsible for co-ordination of the National SAR program, for the overall planning, programming, monitoring and evaluation of the federal element of the Program and overall program policies, advised by a single official who is supported by an organization independent of other interests in any of the departments responsible to the minister, and with a view to early implementation of these principles, it is further recommended that:

IMMEDIATE STRENGTHENING OF ICSAR

(a) a single chairman of ICSAR, and a director of the ICSAR Secretariat be named;

(b) responsibility and accountability for planning, programming, monitoring, evaluation and overall policies for the federal element of the National SAR Program run from the responsible minister to the chairman, to SAR program activity and task co-ordinators in and appointed by departments;

(c) The Secretariat be established as a separate responsibility centre with the staff responsible and accountable to the Director of the Secretariat; and

(d) the specific responsibilities of ICSAR, its Secretariat and the activity and task co-ordinators for the planning, programming, implementing, monitoring and evaluation of and overall policies for the federal SAR element of the National SAR Program be defined by the Chairman of ICSAR and approved by the responsible minister, in line with Annex C.

MINISTERIAL RESPONSIBILITY

(10) The Chairman of the Cabinet Committee on Foreign and Defence Policy recommend to the Prime Minister that consideration be given to the desirability of:

(a) a minister other than the Minister of National Defence being named as the minister responsible for co-ordinating the National SAR Programs, and for the federal element of the Program; and

(b) the creation of a stronger management focus than provided for by recommendation (9) which would co-ordinate the National SAR Program and manage the federal element of the Program, including setting requirements for and arranging with departments and other public and private organizations for execution of various elements of the federal Program, and controlling resources.

FINANCING FROM ONE EXPENDITURE ENVELOPE

(11) The federal SAR program be financed from one expenditure envelope.

LONG TERM PLAN

(12) There be a Long Term National SAR Program Plan, and a three year rolling annual federal plan.

TRADE-OFFS

(13) Three alternative program mixes and resource levels be presented to ministers when seeking their approval for the annual plan.

PRIORITIES

(14) Priority for improvements in the federal SAR program be:

(a) prevention;
(b) management;
(c) within programs impinging on SAR, access to accurate weather information; and
(d) within operations, measures to reduce notification and decision times, greater use of volunteers, and improved means to employ ships of opportunity.

OUTLINE OF AND CONSIDER-ATIONS IN LONG TERM PLANNING

(15) The management focus develop an outline of and initial considerations leading to a Long Term National SAR Program Plan intended to improve on the cost-effectiveness of the 1982/83 SAR Plan, for presentation to ministers at the earliest opportunity including:

(a) definition of the federal SAR program structure, including program elements, objectives and tasks;

(b) assignment to departments of lead responsibility for activities and tasks;

(c) a description of three proposed resource mixes to be explored for long term planning purposes, one of which should provide for a SAR marine response posture based on:

i) substantially greater use of volunteers, particularly in the Victoria SRR region;

ii) increased use of multi-tasking;

iii) improved means to determine the location of, to communicate with and to employ ships of opportunity, particularly existing government fleets; and

iv) vessels with substantially faster response capability;

(d) an indication of the upper and lower expenditure limits of the financial envelopes to be explored for planning purposes;

(e) a discussion of how long term planning for DND SAR air response can be incorporated in the Long Term National SAR Program; and

(f) goals for the development, approval by ministers and implementation of policies for the use of SAR resources in non-distress incidents, with priority given to the development of policies with respect to:

i) towing,

ii) the provision of mechanical assistance and fuel,

iii) humanitarian and civil aid, and

iv) cost recovery for the above.

CRITERIA FOR CHOICE

(16) The specific values of the standards for levels of service proposed by the Evaluation Team be used as a starting point for developing the long term planning options, and the Team's proposals for descriptors, indicators, and measures be implemented as the initial basis for performance measurement.

(17) Operations research and costing models for force posture analysis be further developed.

ACTIVITY AND TASK CO-ORDINATION ASSIGNMENTS

(18) The management focus be responsible for:

(a) overall co-ordination of the development of improved management, financial control and reporting systems, operations research, costing models, and the supporting data bases for the federal SAR program;

(b) conducting a review of and providing a report to ministers on research and development in Canada and other countries directed at or having the potential for improving SAR operations and prevention performance, as an initial step to improving the co-ordination of SAR related research and development;

(c) co-ordinating the preparation and publication of an annual review of the causes of SAR incidents, the characteristics of the vessels, aircraft, mariners and pilots involved, of the kind of assistance provided, by whom and at what cost; and

(d) co-ordinating SAR program public relations and information programs concerning existing and proposed levels of service standards and goals, and the causes, consequences, costs of SAR incidents, and the risks borne by SAR personnel.

(19) The Department of Transport, in co-operation with the Department of National Defence, the Department of Regional and Industrial Expansion and the Department of Communications, take the lead in developing improved technologies for the detection and location of air and marine distress, including satellite systems and electronic locator devices for installation in private and small commercial aircraft and vessels, and in establishing controls on the use of, and specifications for, personal locator beacons.

(20) The SAR division of the Canadian Coast Guard be responsible for identification of marine SAR prevention target populations, based on analysis of SAR data and for identification of causes of SAR incidents, based on increased investigative efforts and analysis.

DEPARTMENTAL ORGANIZATION CCG

(21) Within the Canadian Coast Guard, the Chief of SAR report to the Commissioner Canadian Coast Guard.

(22) The authority, responsibility and accountability for the design and delivery of marine SAR prevention measures to be assigned to a Small Craft Division within the Ship Safety Branch.

MANAGEMENT AND FINANCIAL CONTROLS

(23) ICSAR through its Secretariat arrange, in consultation with TBS, for a study to establish accounting principles and practices to achieve consistency in accounting or reconciliation of DND, DOT and DFO accounts for SAR program costs.

(24) The Treasury Board Secretariat, in consultation with the Office of the Comptroller General, ICSAR Secretariat, Interdepartmental Secretariat, Ministry of State for Economic and Regional Development Secretariat and Privy Council Office review the current arrangements for management and financial

reporting and control of the SAR program and make further recommendations thereon to the responsible minister.

(25) Ministerial approval be obtained for a set of national SAR program objectives, policies and levels of service, with standards and goals for attaining them, against which program performance can be measured.

(26) A national SAR Program Manual be developed consisting of a single document, or an integrated series of documents which define SAR, the National Program and its objectives; the responsibilities of various national, provincial and local authorities for SAR operations and the other elements of the National SAR Program; and SAR policies including policies for the use of dedicated SAR resources for other than SAR purposes.

(27) Increases in person-years and new additional financial resources obtained by departments for the federal SAR program be under controlled allotments.

PERSON-YEAR IMPLICATIONS

(28) The establishment of Ship Safety Branch be increased by eleven positions and eleven person-years to accommodate the new Small Craft Division.

(29) Two person-years be retained from the Boating Safety Detachment in each region for investigation, analysis and co-ordination purposes and the remaining person-years be transferred to the Small Craft Division of Ship Safety Branch.

(30) A position and person-year be provided in DOT/CATA headquarters for external contact and internal co-ordination of aviation SAR prevention and at least one position and person-year be provided for air SAR incident investigation and analysis.

(31) DOT/CATA increase the number of safety awareness and enforcement specialists in the Ontario, Québec and Pacific regions by a total of eight person-years.

(32) The complement of the ICSAR Secretariat be increased to include a Director and three full-time officers and associated support staff, and the Secretariat be provided an annual budget for the conduct of studies to improve the quality of analysis and management of the SAR Program.

SAR OPERATIONS

The Evaluation Team recommends that:

(33) Priority for improving SAR operations be to reduce notification times and SAR system response times, including decision times as follows:

REDUCE NOTIFICATION TIMES

(a) Fuller exploitation of improved technology for notification and location including;

- i) development of crashworthy and lower cost reliable electronic locator beacons,
- ii) continuing emphasis on development and introduction of satellite aided electronic distress signalling,
- iii) the establishment of discreet VHF/FM and CB distress frequencies, and
- iv) research and development on and use of low cost alternate visual or electronic visual signalling aids.

REDUCED DECISION TIME

(b) Improving the conditions, communications, data management and aids to making decisions within the Rescue Co-ordination Centres;

GREATER USE OF VEHICLES OF OPPORTUNITY

(c) Improved means to identify and employ vehicles of opportunity by;

- i) determining how they can best be located,
- ii) retrofitting existing and equipping all new federal government vessels over 20 metres in length with boarding boats, VHF/DF AM and FM homers, CB radios, portable pumps and firefighting equipment,
- iii) equipping smaller federal government vessels with VHF/FM and CB radios, and
- iv) equipping all suitable federal government helicopters to carry a removable hoist and providing SAR training for their crews;

GREATER USE OF VOLUNTEERS

(d) Greater use of properly equipped and trained provincial resources, and of volunteers in their own craft or as full or partial crews aboard CCG vessels and, to this end, a review of tasking policies particularly in the Victoria SRR.

MULTI-TASKING

(34) Multi-tasking of DFO vessels be increased to provide SAR coverage in those areas which have low traffic and low incident rates.

(35) A study be undertaken under the direction of the management focus to determine the benefits and cost of providing round-the-clock SAR coverage through the Department of Fisheries and Oceans programs as opposed to funding such coverage through the SAR Program.

USE OF LEVELS OF SERVICE STANDARDS

(36) Levels of service standards be used as a benchmark to determine the adequacy of existing, and the need for better, coverage and response through:

(a) an agreement with the U.S. Coast Guard for coverage of areas 301, 302 and 303 in return for Canadian air coverage from Masset for southern Alaska;

(b) multi-tasking of suitable CCG helicopters;

(c) contracting for services with the private sector, and

(d) replacement of existing vehicles with vehicles of improved speed and/or endurance, of Canadian or foreign design, including;

i) higher performance fixed and rotary wing aircraft, and

ii) higher performance vessels in the 400/500, 200 and 100 classes.

MAJOR MARINE DISASTERS

(37) Contingency plans be prepared for major disasters in the maritime environment.

POLICIES FOR ASSISTING IN NON-DISTRESS

(38) Policies be developed for the approval of ministers for the use of SAR resources to assist in non-distress incidents for:

(a) towing;

(b) providing mechanical assistance and fuel; and

(c) humanitarian and civil aid;

and cost recovery for the above.

(39) In deciding on cost recovery policies, emphasis be placed on encouraging the private sector to develop and provide services to respond to incidents and in particular to non-distress.

IDENTIFICATION OF PRIMARY SAR VEHICLES

(40) Primary SAR vessels have the words "RESCUE" and "SAUVETAGE" clearly displayed and their superstructure be painted to contrast with the sea.

SAR PREVENTION

The Evaluation Team recommends that:

NATIONAL AND REGIONAL SAR ADVISORY COUNCILS

(41) National and regional SAR advisory councils having members, including experts, drawn from public and private, federal, provincial and local agencies, be established to advise ICSAR on the co-ordination, content and delivery of the National SAR Program.

(42) The Marine Safety Advisory Council and, in particular, its Small Craft Committee be invited to consider how it might best participate in the development of advice on the content and delivery of a national program of marine SAR prevention.

ALIGN SAR PREVENTION AND AVIATION AND MARINE SAFETY PRIORITIES

(43) The objectives, activities, tasks and levels of service standards for SAR prevention set out in Annex D be adopted as a basis for planning, programming, monitoring and evaluating the SAR prevention element of the National SAR Program, and for influencing the priorities and content of aviation and marine safety programs generally.

TARGET POPULATIONS DEFINED

(44) DOT/CATA focus increased SAR prevention effort on private licensed pilots, owners and operators of private and small commercial charter aircraft, with priority for users of small fixed and rotary wing aircraft in Ontario, Québec and British Columbia.

(45) DOT/CCG focus SAR prevention measures on fishermen and pleasure craft operators.

FOCUS EXPANDED PROMOTION & EDUCATION

(46) DOT greatly increase SAR prevention promotion and education for the aviation and marine target population by using the CMRA, the proposed CASARA, and other interested organizations for their delivery.

(47) DOT/CCG Boating Safety Detachments, as first priority, be employed to instruct persons or groups who could in turn instruct large numbers of target populations.

STRENGTHENED INCIDENT INVESTIGATION ANALYSIS AND FOLLOW-UP

(48) DOT investigative efforts and analysis of the causes of aviation and marine SAR incidents be increased, both in the regions and at headquarters.

OPERATIONS AND PERSONNEL SURVIVAL STANDARDS

(49) DOT/CCG, through the Marine Safety Advisory Council assist and encourage the development of national voluntary standards of knowledge and competence for small boat operators.

(50) DOT/CATA raise the standards for training and qualification of ground instructors, for maintaining a private pilot's

licence and for flight by private licensed pilots in mountainous and sparsely settled areas.

(51) DOT/CATA raise the standards for private and commercial pilot training and licensing for en route visual flight and for knowledge levels in meteorology and personnel survival.

(52) DOT/CATA review the criteria for and revise the boundary between sparsely settled and settled areas in Canada.

INCREASED ENFORCEMENT

(53) DOT/CCG compliance measures for enforcement of regulations relating to small craft be enhanced to include:

(a) boarding and cursory inspections of craft;

(b) prohibition of vessel operation;

(c) verbal and written citations and warnings; and

(d) imposition of fines and charges.

(54) DOT, in co-operation with the Solicitor General and Provincial Attorneys General, the RCMP and provincial police forces and in consultation with ICSAR, develop an action plan to be included in the Annual SAR Plan, for more vigorous enforcement of violations of flight planning, en route weather minima and personnel survival regulatory standards, and of regulations relating to small craft.

PROGRAMS IMPINGING ON SAR

IMPROVED AIR NAVIGATION AND AVIATION AND MARINE WEATHER SERVICES

(55) DOT/CATA, in consultation with ICSAR, develop an action plan to be included in the annual SAR Plan to improve processes and procedures for flight following of en route aircraft operating under visual flight rules.

(56) DOT/CATA, in co-operation with the US/FAA and in consultation with other government agencies in both Canada and the U.S.A., develop and implement a program designed to inform U.S. private and commercial licensed pilots of the hazards and special requirements for flight in Canada.

(57) DOT/CATA, in co-operation with the Atmospheric Environment Service and in consultation with ICSAR, review the requirements for and develop an action plan to be included in the annual SAR Plan, for improved aviation weather services for private and small commercial aviation in Canada.

(58) DOT/CGG, in co-operation with the Atmospheric Environment Service and in consultation with ICSAR, review the requirements for and develop an action plan to be included in the annual SAR Plan, for improved access to marine weather services.